Comparative Physical and Organoleptic Properties, Nutritional Composition, and Safety of Charcoal and Oven Smoked Noiler Meat Spiced Asun.

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Abstract
Five Matured Noiler chickens 3 months old weighing 3kg±120g were used for the experiment. The birds have fasted for 16 hours without food but with a supply of fresh cool water. The birds were slaughtered and dressed conventionally. The breast meat was excised within one-hour post-mortem and used for the preparation of Asun using charcoal and oven smoking. The breast meats were cut into fillets of average weight without bone; the fillets were spiced, rubbed with vegetable oil, and smoked using charcoal and oven to an internal temperature of 72°C for 20 minutes with regular turning. The result shows a significant difference (p<0.05) in the nutritional and chemical composition of raw and smoke Noiler meat. The charcoal and oven-smoked Asun were not different, but both differ from the raw. The organoleptic properties show no significant difference (p>0.05) in color, aroma, and texture while flavor, juiciness, and overall acceptability differ. There was a significantly different (p>0.05) in WHC, cooking loss, and cooking yield. Preparation of Asun using charcoal and oven smoking contributed to the nutritional component except for the moisture content. The cholesterol, SFA, MUFA, PUFA, and amines were also increased. The value obtained shows that charcoal and oven-smoked Noiler meat Asun is safe for consumption and has no negative effect, also impacts positively on both the physical and organoleptic properties of the prepared product and therefore, recommended for the preparation of Asun using Noiler meat.

Keywords: Charcoal, Noiler, Organoleptic, Oven, Smoke

Introduction
Asun is a smoked grilled or barbecued spiced goat meat. However, based on choice or availability, Asun could also be prepared from other animal types. As a delicacy, Asun could be prepared at home by individuals. It is also available as ready-to-eat meat in nightclub centers, hotels, and relaxation centers (Akharaiyi and Isunu, 2015). Meat and meat products are very important sources of nutrients in human diets. From farm to table, the whole process of obtaining meat and its products includes animal handling, transportation, and slaughtering process, followed by preservation techniques aimed at extending the shelf life of fresh meat and processing aimed at converting meat into desirable meat products (Pal and Dervani, 2018). The effort to preserve and make meat more desirable for consumption has increased the demand for meat processing. Consumption of processed meat products has greatly increased due to the availability and accessibility of ready-to-eat meat products. The food safety implication of processed ready-to-eat meat products calls for global concern, despite increased patronage (Sofos, 2008). The awareness of consumers about
the influence of what they consume on their health has led to the concept of functional food; this has inspired investigation into functional meat development and also in conserving the nutritive values of the product (Eze et al., 2017). Meat processing plays an important role if fully utilizes meat resources; including nearly all edible livestock parts that can be processed for human food consumption. Meat processing is the transformation of animal muscle, fat, and non-meat additives into meat products. Consumers’ perception of a meat product is enhanced by meat additives. Meat additives can be used to increase product value for specific meat preparation. Animal by-products such as internal organs, slain, and blood is also well suited for meat processing. Meat processing creates different types of product compositions that optimize the usage of edible livestock parts making it tasty, attractive, and nourishing (Chen et al., 2018).

The nutritional quality of Asun is primarily determined by the chemical composition of the muscle tissue used, post-mortem biochemical changes that lead to the conversion of muscle to meat and the additive used in the preparation. Muscle and connective tissues are the most abundant tissues in meat; their properties and the relative proportion of each tissue are responsible for the leanness and quality of meat (Astruc, 2014).

Asun is made from meat and meat is considered rich to be in essential amino acids, mineral contents to a lesser extent, essential fatty acids, and vitamins (Eze et al., 2017). Meat can be smoked using different sources of smoke and smoking materials using a smoker and outdoor grill, oven grill, and saucepan (no grill no smoke) (Ahmed et al., 2020). Smoking is an aged-old preservation technique, where meat is subjected to smoking; it affects the sensory and nutritional composition of the meat products. Smoking impacts positively on the flavor, color, odor, and overall acceptability of meat products. Effect of smoking, on meat, increases with the time of exposure, type of smoke and intensity of smoking. Hot smoking, cold smoking, electrostatic smoking, condensates smoke aromas and liquid smoke are commonly used smoking treatments. Meat is smoked at 20-250°C at a relative humidity of 70-80% and 75-800°C during cold and hot smoking respectively (Beriai et al., 2011). Smoking reduces the water activity of meat, which affects the hardness and protein stability of the products. One of the advantages of meat processing is the integration of certain animal tissues such as muscle trimming, bone scraps, skin parts, and internal organs which are usually not sold in fresh meat marketing, into the food chain as valuable protein-rich ingredients (Eze et al., 2017).

Smoking is considered an effective treatment and a preservative measure against pathogenic micro-organisms, it also reduces lipid oxidation which usually causes undesirable flavors and oxidative rancidity in stored processed meat (Dieguez et al., 2010). The study will provide accessible information on the influence of charcoal and oven smoking on nutritional safety, consumers’ perception, and physical attributes of Asun (spiced smoked meat) made from Noiler chicken.

Materials and Methods

Experimental location

The experiment was conducted in the Meat Science Laboratory, Department of Agricultural Technology, Institute Applied Science, Kwara State Polytechnic Ilorin, Nigeria.

Sample Collection

The breast muscles of five mature Noiler chickens aged 3 months were used. The Noiler chickens were acclimatized and conditioned for slaughtering and processing. The Noiler chickens were fasted overnight for 16 hours without feed but were supplied with cool fresh water. Slaughter and dressed conventionally within one-hour post mortem. The muscle of the breast was
excised and cut into fillets of average weight without bone, but with fat, skin, and connective tissues (Omojola et al., 2012). The meat fillets were cool in ice-packed containers and transferred to the meat laboratory for Asun production.

### Preparation of Spice Mixture

The ingredients in Table 1 were used for the species formulation, each of the species was dried, ground, sieved, and weighed separately, and other species were weighed and used as bought. The species were combined, mixed thoroughly, and stored in an airtight container for further use.

### Table 1. Composition of formulated recipe used for Asun production

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Scientific Names</th>
<th>Quantity (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salt</td>
<td>Sodium chloride</td>
<td>7.0</td>
</tr>
<tr>
<td>Maggi</td>
<td>Monosodium glutamate</td>
<td>12.0</td>
</tr>
<tr>
<td>Thyme</td>
<td>Thymus vulgaris L.</td>
<td>6.0</td>
</tr>
<tr>
<td>Curry</td>
<td>Murraya koenigii L.</td>
<td>6.0</td>
</tr>
<tr>
<td>Pepper</td>
<td>Piper Nigrum L.</td>
<td>25.0</td>
</tr>
<tr>
<td>African nutmeg</td>
<td>Mobogora myristica</td>
<td>3.0</td>
</tr>
<tr>
<td>Ginger</td>
<td>Zingiber officinale</td>
<td>3.0</td>
</tr>
<tr>
<td>Garlic</td>
<td>Allium sativum L.</td>
<td>3.0</td>
</tr>
<tr>
<td>Clove</td>
<td>Syzygium aromaticum L.</td>
<td>2.0</td>
</tr>
<tr>
<td>Onions</td>
<td>Allium cepa L.</td>
<td>23.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>90.00g</strong></td>
</tr>
</tbody>
</table>

Source: experimental research (2022).

The recipe was added in the ratio 1:25 (40g recipe to 1000g meat). The recipe was made into a broth solution. The fresh onions were peeled, sliced, weighed, and added to other weighed ingredients and blend in an elective blender with 200ml water to form a broth solution. The broth solution was refrigerated for subsequent use.

### Cooking of meat

500g Noiler breast meat fillet each was weighed rinsed in cool water and blotted dry wrapped in foil paper. 20g of the prepared broth recipe solution was rubbed separately on each meat, wrapped and steam cooked separately at 100°C for 30min, then cool down to 28°C room temperature before smoking (Omojola et al., 2012).

### Smoking of Cooked Meat

Smoking was done in an electric oven according to a modified method by Soepamo et al. (2015). The oven was preheated to an internal temperature of 100 degrees. The meat was rubbed with vegetable oil (cholesterol-free) to prevent the meat from having a dry crack surface. The meat was smoked for 20min, with regular turning for the meat to be evenly smoked. Smoke was generated in the oven by dropping drops of oil on the electric filament of the oven. Smoking was done using the open charcoal grilling (locally made charcoal pot) method. The charcoal was heated to cherry red with wire gauze placed in the charcoal grill pot. The meat was placed on the wire gauze and covered allowing the meat to be smoked for 20min at regular turning intervals.

### Analytical methods

**Proximate analysis:** proximate composition of the raw Noiler meat and the prepared Asun was conducted using the method described by AOAC, (2005). The total cholesterol composition of Asun was carried out as described by Weyant et al. (1976). Polycyclic Aromatic Hydrocarbons (PAH) were determined using gas chromatography-mass spectrophotometry (GCMS) according to Duedal-Olesen et al. (2010). Heterocyclic Aromatic Amines (HAAs) were determined using a gas chromatography-mass spectrophotometer (GCMS) according to Duedahl-Olesen et al. (2010). The fatty acids composition of the freshly prepared
Asun was assessed using the method described by Lowry and Tinsley, (1976).

**Cooking loss:** loss in weight during smoking was measured by weighing the cooked meat samples before smoking for 20min until the meat reaches an internal temperature of 72°C. The Asun was allowed to cool down to room temperature of 28°C and reweighed again to calculate cooking loss (Omoloja et al., 2014)

Cooking loss (%) = initial weight of meat - cooked weight of meat / Initial weight of meat * 100

**Cooking yield:** increase in weight due to smoking of Asun was calculated using the method described by Omoloja et al. (2014).

Cooking (Product) yield (%) = Weight of Asun/ weight of raw meat * 100

**Water holding capacity** (WHC) was assessed using a slightly modified method described by Suzuki et al. (2001). 1g each of differently smoke Asun sample was sandwiched between two 9cm Whatman No1 filter papers separately. The filter papers were placed in between two 12 X 12 cm² Plexiglass and then pressed at about 35.2 kg/cm3 absolute pressure for 1 minute using a vice. The meat samples were removed and oven dried at 80°C for 24 hours to determine the moisture content. The amount of water released from the samples was measured indirectly by measuring the area of filter paper wetted relative to the area of pressed meat samples. The procedure was carried out separately for oven and charcoal smoke Asun and replicated thrice. Thus, the water holding capacity was calculated as follows:

\[
\text{WHC} = 100 - \left\{ \left( \frac{\text{Aw}}{\text{Am}} \times 9.47 \right) \right\} / \text{Wm-Mo} \\
\text{Where:} \\
\text{Aw} = \text{Area of water released from meat samples} (\text{cm}^2) \\
\text{Am} = \text{Area of meat sample} (\text{cm}^2) \\
\text{Wm} = \text{weight of meat sample (g)} \\
\text{Mo} = \text{moisture content of meat sample (}) \\
9.47 = \text{a constant factor}
\]

**Organoleptic Properties**

Forty semi-trained panelists of mixed gender, different backgrounds, and ages, were used for the sensory evaluation. The panelists were made to rate each of the different smoke Asun replicates. Equal bite sizes from each processed Asun were served in a separate coded odorless plate. The panelist rated each sample on a nine-point hedonic scale with a maximum score of 9 for the extremely high condition while the lowest score of 1 was assigned to the poorest condition. The parameters evaluated include flavor, aroma, juiciness, texture, and overall acceptability (Omojola et al., 2014).

**Data Analysis**

All data obtained were subjected to analysis of variance (ANOVA), and the treatment means were compared using Duncan’s multiple range test (Duncan, 1995). SAS 2000 computer software package was used for the statistical analysis.

**Results and Discussion**

The moisture content of differently smoke Asun and the raw meat of Noiler differs significantly (P<0.005). The moisture content of raw meat was higher than the differently smoke Asun, while the charcoal-smoked Asun had more moisture than the oven-smoked. The loss in moisture may be due to the high oven temperature. The result also shows that oven smoking reduces moisture content compared to charcoal smoking. The result is within the range reported by Alfaia et al. (2010) who stated that maximum moisture content of 74.42% was found in cooled samples of chicken meat and a minimum of 54.4% was found in a charcoal-roasted sample of chicken meat. Omojola et al. (2014) reported that the higher the cooking temperature the more moisture will be lost. The protein, ether extract, ash, and total cholesterol content in raw meat was lower (p<0.05) compared to differently smoked Asun. The protein, ether extract, ash, and total cholesterol content were not affected by smoking methods.
Both the oven and charcoal smoke Asun had the same percentage of crude protein, crude ether extract, crude ash, and total cholesterol content which was higher than the raw meat. Juaraz et al. (2010) reported an increase in the nutritional content of Buffalo meat after cooking. With the highest obtained in fried meat samples. Nobrega et al. (2006) indicate that all smoking treatments increase the proximate content of processed meat. There were only slight differences (p>0.05) in the cholesterol content of raw meat and Noiler meat processed into Asun. Alina et al. (2012) results show that all cooking treatments caused as an increase in cholesterol content except microwave cooking. Omojola et al. (2014) reported that processing method increased the physicochemical properties of differently processed Muscovy drake breast meat. The unsaturated fatty acids, monounsaturated fatty acids, and polyunsaturated fatty acids contents were lower in raw Noiler meat but higher in processed meat. There was no statistical difference (p>0.05) in the fatty acids content of both charcoal and oven smoked Asun. Alina et al. (2012) reported an increase in the fatty acid composition of raw, grilled, boiled, fried, and microwave roasted samples (18.5, 29.4, 30.2, 24.8 and 30.0% respectively). The unsaturated fatty acids mainly PUFA were affected by cooking methods, considering the parts of the membrane structure (Gerber et al., 2009).

THAAs (total heterocyclic aromatic amines) and TPHA (total polycyclic heterocyclic amine) were not detected in raw Noiler meat. Charcoal smoking increases the THAAs in Noiler Asun to 26.96ng/g and oven smoking to 24.88ng/g which were not significantly different. Charcoal smoking increases the TPHAs in Asun to 2.82ng/g and oven smoking to 4.180ng/g in the processed Asun. Reports have suggested that amines are formed when meat is cooked at high temperatures (Sinha et al., 1995). The value of HAA obtained in this study was lower than that obtained by Liao et al. (2009) and Omojola et al. (2014) who reported 53.3ng/g total HAAs in processed duck breast meat. Different smoking materials did not increase THCAs broiler meat beyond the daily recommended dose (Ahmed et al., 2020). The values obtained in this study were lower than 32ng/g obtained for charcoal grilling of duck breast meat by Solyakov, (2012). Liao et al. (2009) suggested that poultry meat prepared under different cooking conditions contains variable levels of HAAs. Total heterocyclic aromatic amine concentration in cooked meat ranges from less than 1ng/g to about 500ng/g, but usually less than 100ng/g (Sinha et al., 1995).

### Table 2. Nutritional and chemical composition of raw, charcoal, and oven smoked Noiler chicken Asun

<table>
<thead>
<tr>
<th>Nutritional and chemical composition</th>
<th>Raw unsmoked</th>
<th>Charcoal smoked</th>
<th>Oven smoked</th>
<th>MSE</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture %</td>
<td>70.88&lt;sup&gt;a&lt;/sup&gt;</td>
<td>57.01&lt;sup&gt;b&lt;/sup&gt;</td>
<td>51.18&lt;sup&gt;c&lt;/sup&gt;</td>
<td>1.059</td>
<td>0.000</td>
</tr>
<tr>
<td>Protein %</td>
<td>22.64&lt;sup&gt;b&lt;/sup&gt;</td>
<td>32.58&lt;sup&gt;a&lt;/sup&gt;</td>
<td>32.84&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.008</td>
<td>0.000</td>
</tr>
<tr>
<td>Ether extract %</td>
<td>9.93&lt;sup&gt;b&lt;/sup&gt;</td>
<td>12.62&lt;sup&gt;a&lt;/sup&gt;</td>
<td>12.41&lt;sup&gt;a&lt;/sup&gt;</td>
<td>315</td>
<td>0.000</td>
</tr>
<tr>
<td>Ash %</td>
<td>2.36&lt;sup&gt;b&lt;/sup&gt;</td>
<td>5.36&lt;sup&gt;a&lt;/sup&gt;</td>
<td>5.20&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.15</td>
<td>0.000</td>
</tr>
<tr>
<td>Total cholesterol mg/g</td>
<td>50.06&lt;sup&gt;b&lt;/sup&gt;</td>
<td>56.61&lt;sup&gt;a&lt;/sup&gt;</td>
<td>56.42&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.253</td>
<td>0.000</td>
</tr>
<tr>
<td>S.F.A ng/g</td>
<td>1.27&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2.06&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.98&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.01</td>
<td>0.000</td>
</tr>
<tr>
<td>MUFA ng/g</td>
<td>1.87&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2.56&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.49&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.01</td>
<td>0.000</td>
</tr>
<tr>
<td>PUFA ng/g</td>
<td>0.52&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.85&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.75&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.201</td>
<td>0.000</td>
</tr>
<tr>
<td>THAAs ng/g</td>
<td>0.00&lt;sup&gt;b&lt;/sup&gt;</td>
<td>26.96&lt;sup&gt;a&lt;/sup&gt;</td>
<td>24.88&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.257</td>
<td>0.000</td>
</tr>
<tr>
<td>TPHA ng/g</td>
<td>0.00&lt;sup&gt;c&lt;/sup&gt;</td>
<td>2.82&lt;sup&gt;a&lt;/sup&gt;</td>
<td>4.180&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.007</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Mean values having the same superscripts were not significantly different p<0.05.
Mean values having different superscripts were significantly different p>0.05.
S.F.A (saturated fatty acid), MUFA (monounsaturated fatty acid), PUFA (polyunsaturated fatty acid), THAAs (total heterocyclic aromatic amines), TPHA (total polycyclic heterocyclic amine).

The result of taste panelist perception towards the differently smoked Asun made from Noiler breast meat is presented in table 3 below. Three of the parameters; color, aroma, and texture did not differ significantly (p>0.05) while the other three parameters; flavor, juiciness, and overall acceptability were rated differently (p<0.05) by the taste panelist. The color which is the first point of attraction of consumers to a particular product (Omojola et al., 2014) was not affected by the two different smoking methods employed in the study. The aroma and texture were not impacted by the charcoal and oven smoking. The color, aroma, and texture were equally perceived and rated by the taste panelist. The flavor which is the response of the taste buds of the tongue to a particular foodstuff (Beriain et al., 2011) was rated differently by the panelist. The flavor was rated high in charcoal smoked Noiler Asun. This might be a result of the wood the charcoal is made from. Smoking foods by conventional wood or charcoal smoke condensate flavors. The juiciness and overall acceptability of charcoal and oven-smoked Noiler Asun were also affected by a high-value score for oven-smoked Asun compared to charcoal-smoked Asun. The use of different smoking materials increases the palatability and consumers’ perception of broiler meat (Ahmed et al., 2020). Smoking affects the eating qualities, consumers’ perception, and nutritional information of meat products. Smoking impacts desirable effects on flavor, color, and odor in lamb meat. Changes in the characteristics of meat increase with the time of exposure to smoking temperature (Ahmed et al. 2020; Beriain et al., 2011).

Table 3. Organoleptic properties of charcoal and oven smoked Noiler chicken Asun

<table>
<thead>
<tr>
<th>Organoleptic properties</th>
<th>Charcoal smoked</th>
<th>Oven smoked</th>
<th>MSE</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colour</td>
<td>4.00*</td>
<td>3.00*</td>
<td>2.125</td>
<td>0.231</td>
</tr>
<tr>
<td>Flavour</td>
<td>8.00*</td>
<td>5.00*</td>
<td>1.792</td>
<td>0.004</td>
</tr>
<tr>
<td>Aroma</td>
<td>7.00*</td>
<td>7.00*</td>
<td>2.646</td>
<td>0.137</td>
</tr>
<tr>
<td>Texture</td>
<td>7.00*</td>
<td>7.00*</td>
<td>4.125</td>
<td>0.201</td>
</tr>
<tr>
<td>Juiciness</td>
<td>4.00*</td>
<td>5.00*</td>
<td>2.000</td>
<td>0.001</td>
</tr>
<tr>
<td>Overall</td>
<td>6.00*</td>
<td>8.00*</td>
<td>0.625</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Mean values having the same superscripts were not significantly different p<0.05
Mean values having different superscripts were significantly different p>0.0

The result of the physical properties of Asun; spiced smoke meat made from Noiler, and processed using oven and charcoal smoking methods are shown in table 4 below. The result shows that there was a significant difference (p<0.05) in the water holding capacity, cooking yield, and cooking loss of Asun therein produced. Water holding capacity (WHC) is the amount of moisture meat can retain after subjecting to heat treatment for a particular period. The water holding capacity was high in Asun prepared from Noiler meat using the charcoal smoking method compared to the oven smoking method. The result revealed that different smoking methods impacted the WHC while oven smoking causes more water loss. Charcoal smoking was able to retain water in the final products (69.70 and 73.58 respectively). Cooking loss refers to weight loss when meat is subjected to heat treatment at a particular temperature for a particular period (Alina et al., 2012; Ahmed et al., 2020). Cooking loss is a determinant of meat fat content and leanness of the meat. There was a significantly different (p<0.05) in the shrinking of meat in Noiler during processing using an oven and charcoal. Cooking loss was low in charcoal smoked Noiler and high in oven smoked Noiler respectively (18.68 and 21.05 respectively). Cooking yield is the opposite integral of cooking loss, the lower the cooking loss the higher the cooking yield (Omojola et al., 2014). There was a significantly different
(p<0.05) in the yield of meat in Asun made from Noiler during processing using oven and charcoal. The cooking yield was high in charcoal smoked Noiler while it was least in oven processed Noiler (81.32 and 78.95 respectively). The change in yield of the differently processed Asun might be due to temperature and time combination effects, as reported by Omoljola et al., 2014; Beriain et al., 2011 and Dieguez et al., 2010).

Table 4. Physical properties of charcoal and oven smoked Noiler chicken Asun

<table>
<thead>
<tr>
<th>Physical properties</th>
<th>Charcoal smoked</th>
<th>Oven smoked</th>
<th>MSE</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHC %</td>
<td>73.58&lt;sup&gt;a&lt;/sup&gt;</td>
<td>69.70&lt;sup&gt;b&lt;/sup&gt;</td>
<td>7.933</td>
<td>0.002</td>
</tr>
<tr>
<td>Cooking loss %</td>
<td>18.68&lt;sup&gt;a&lt;/sup&gt;</td>
<td>21.05&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>0.253</td>
<td>0.000</td>
</tr>
<tr>
<td>Cooking yield %</td>
<td>81.32&lt;sup&gt;a&lt;/sup&gt;</td>
<td>78.95&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>0.253</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Mean values having the same superscripts were not significantly different p<0.05. Mean values having different superscripts were significantly different p>0.05.

Conclusion

Investigation into the healthiness, safety, and wholesome of processed meat products plays an essential function in maintaining the health status of humans. Wood smoking is one of the ancient methods of meat processing, charcoal, and the oven is relatively new and gaining prominence in outdoor meat processing. The result of the experiment concluded that smoking poultry meat using charcoal and an oven increases the nutritional content of the Asun made from Noiler chicken meat as compared to raw meat. Other components such as cholesterol, saturated fatty acid, monounsaturated fatty acids, and polyunsaturated fatty acid also increased with charcoal and oven smoking. Other aromatic amines were also generated due to temperature and the smoking effects involved in the processing of Noiler chicken meat into Asun but below the daily recommended doses. The processing methods also impacted positively on both the physical and organoleptic properties of the prepared product and therefore, recommended for the preparation of Asun using Noiler meat.

Conflict of Interest

The above research work has no conflict of interest whatsoever with any completed findings, before, during, and after the collection of data and writing of this paper.

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References


