Sausages Some Quality Attribute

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Abstract: This study was aimed to evaluate the quality attributes of Camel, beef and goat sausages. The result showed the Lightness (L) values were highly significant (P< 0.001) between the three types of sausage. Goat sausages recorded the highest values compared to beef and camel sausages as (32.15, 31.8 and 28.5) respectively. Redness (a) values were not significantly (P>0.05) different. Goat sausages recorded higher values followed by beef and camel sausages as (11.56, 11.45 and 10.40) respectively. Similarly, yellowness (b) values were not significant (P> 0.05) different. Goat sausages recorded the highest values followed by beef and camel sausages as (8.56, 8.48 and 7.67) respectively. Water Holding Capacity in camel sausages recorded the lowest values (0.48) compared to beef and goat sausages as (1.06 and 0.69) respectively, (camel sausages had the highest water holding capacity compared to beef and goat sausages). Camel sausage had higher cooking loss (24.12%) compared to beef and goat sausages as (21.45 and 22.0%) respectively. The pH values showed no significant (P > 0.05) different between the three types of sausage. pH values were (5.65, 5.73 and 5.66) for camel, beef and goat sausages respectively.

Keywords: Quality Attribute, Cooking Loss, Water holding capacity, color, pH, camel, beef and goat sausages

I. INTRODUCTION
Sudan is situated in northeast Africa between latitudes 4° and 22° north and longitudes 22° and 38° East. The country is traversed by the River Nile and its tributaries which have varying influences on irrigated agriculture and livestock production systems. There are also number of seasonal rivers and water sources as the Gash and Baraka, which originate from the Ethiopian highlands and form two inland deltas in Sudan. Trout, (1988) reported that the WHC of meat or meat product was determined the amount of product that can be sold and influence the sensory properties of the product such as juiciness, texture, and flavor. Cooking loss is one of the most important properties of sausage products as it is related to water holding capacity. There is variation in water holding capacity among different types of meat from different animal and muscles Lawrie, (1991). Kannan, et al., (2001) stated that cooking loss was highest in leg cuts, intermediate in shoulder/arm cuts, and lowest in loin/rib cuts. Siham, (2008) reported that cooking loss was lower in camel meat compared to beef. Gadiyaram and Kannan, (2004) stated that cooking loss% was lower in chevon sausages (5.5%) compared to beef. Abubaker, et al., (1986) reported that tenderness and color scored highest in sausages containing faba-bean and chick pea while color was acceptable in sausages containing lentils and lupine seeds. Smith, et al., (1974) reported that goat meat and goat meat products were comparable with beef and beef products.

II. MATERIALS & METHODS
This study was conducted in the laboratory of meat, College of animal Production Science and Technology Sudan University of Science and Technology (SUST).

Meat samples: Fifteen kg of fresh deboned camel, beef and goat meat were obtained. Camel meat was purchased from “Soug Elnaga” local market, west Omdurman, beef from kuku research centre, and goat meat from local market.

Fillers: The preparation methods of fillers:
1. Bread Crumbs: was used after being ground through plate of 0.5 cm diameter.
2. Sweet Potato: was cooked under pressure for 10 minutes and ground through plate of 0.5 cm diameter.

Sausages preparation: Three types of sausages were manufactured using two types of fillers (bread crumbs and sweet potato). The ingredients were added equally to the treatments as shown in (Table 1). The Sausage consist of minced meat to which salt (NaCl), garlic, coriander, cinnamon, black pepper, nutmeg, fat, cold water, skim milk and filler 15% were added. The whole mixture was mixed well in a chopper after adding skimmed milk.
powder to the dough. The mixture was stuffed in sheep casings using piston stuffer, then linked, placed in polythene bags, labeled and frozen at -20°C to wait the following tests.

Table (1): Ingredients of the sausage recipe

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fillers (bread crumbs or sweet potato)</td>
<td>15</td>
</tr>
<tr>
<td>Ice water</td>
<td>20</td>
</tr>
<tr>
<td>Salt</td>
<td>2</td>
</tr>
<tr>
<td>Black pepper</td>
<td>0.5</td>
</tr>
<tr>
<td>Coriander</td>
<td>0.5</td>
</tr>
<tr>
<td>Sugar</td>
<td>0.5</td>
</tr>
<tr>
<td>Garlic</td>
<td>0.3</td>
</tr>
<tr>
<td>Skimmed milk powder</td>
<td>0.3</td>
</tr>
<tr>
<td>Cinnamon</td>
<td>0.1</td>
</tr>
</tbody>
</table>

(All ingredients are percentage from the formulated products)

**Quality attributes:** Ten samples from the three types of meat were used for each parameter. Color Measurement was done according to (CIE, 1986). Water Holding Capacity (WHC) was measured according to the modified methods of Jauregui, et al., (1981). Cooking Loss % was determined according to (AMSA, 1995). The samples were free of external visible fat and connective tissue and sub sampled for chemical analysis and quality parameters. Samples for quality attributes were allowed to oxygenate for 2 hours at 4°C before use.

**Color Measurement:** Color measurements were performed using hunter lab Tristimulus colorimeter model D 25 M-2 Hunter. Lightness (L), redness (a) and yellowness (b) were recorded on muscle sample (CIE, 1986).

**Water Holding Capacity (WHC):** One gm from minced meat (LD) was used. Each sample was placed on humidified filter paper (Whatman No. 40) in a desiccators over saturated KCl solution) and pressed between two Plexiglas plates for 3 min. at 25 kg load. The meat film area was traced with a ball pen and the filter paper was allowed to dry. Meat and moisture areas were measured with a compensating Plano-meter (Jauregui, et al., 1981). As follows:

\[
\text{Water holding capacity} = \frac{\text{Loss water area} – \text{meat film area}}{\text{Meat film area}}
\]

**Cooking Loss Determination:** The cooking loss was determined according to (AMSA, 1995). Meat samples were thawed at 5°C for 24 hr. then cut into samples of equal dimensions and weighed Samples were cooked in plastic bags in a water bath at 80°C for 90 min., cooled in running tap water for 20 min., then dried from fluids and reweighed. The cooking loss % was also determined by oven. Frozen samples randomly selected were used for determining cooking losses and thawed for 24 hours in 4°C refrigerator. Two fingers from each treatment were weighed separately and rapped by aluminum foil, then cooked by oven at 160°C for 25-30min. Samples allowed to cooling at room temperature, then reweighed. Cooking losses were determined by weight difference between raw and cooked sausage. The cooking losses were determined according to (Ziprin, et al., 1981). Cooking loss was determined as the loss in weight during cooking and expressed as a percent of pre-cooking weight as follows:

\[
\text{Cooking loss %} = \frac{\text{Weight before cooking} – \text{Weight after cooking}}{\text{Weight before cooking}} \times 100
\]

**pH determination:** One gm of sample was blended with 9 ml of distilled water in a laboratory blender for 2 min, filtered and then pH of the filtrate was determined by digital pH-meter. The meat samples were packed, labeled and kept frozen in -18°C (1 g) The procedure at each measurement involved excising of fresh cut surface and sampling it with sterile plate. The area was covered by polyethylene cover to avoid desiccation. Sample weighing approximately 1 gm was homogenized in 10 ml 5mm iodoacetic acid, 150 mm KCl neutralized to pH7.0 by dilute NaOH and HCL. The pH was then read on laboratory pH meter, (adjusted with buffer, pH 7.0) at room temperature.

**Statistical analysis:** The data collected were subjected to statistical analysis by using complete randomized design used to analyze the results obtained from this study and subjected to ANOVA followed by Least significant difference test (LSD) using the (SPSS, Version 17.0, 2008).

**RESULTS**

Table (2) and figure (1) shows mean values (±SD) of some quality attributes of camel, beef and goat sausages. Hunter lightness (L) values were highly significant (P< 0.001) between three types of sausages studied. Beef and goat sausages recorded higher values than camel sausages. Redness (a) values were not significant (P>0.05) different. Goat sausages recorded higher values followed by beef and camel sausages. Yellowness (b) values were no significant (P< 0.001) different. Goat sausages recorded higher value followed by beef and camel sausages.
sausages. Water holding capacity (WHC) was highly significant (P< 0.01) different among the three types of sausage studied. Camel sausages recorded low values compare to beef and goat sausages (That mean camel sausages have highest water holding capacity compared to beef and goat sausages). Cooking loss was highly significant (P< 0.01) different among the three types of sausage. Cooking loss percent of camel sausage was higher followed by goat meat and beef respectively. There was no significant (P> 0.05) different between the three types of meat in pH values.

Table (2): Mean values (±SD) of some quality attributes of the camel, beef and goat sausages:

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Camel sausages</th>
<th>Beef sausages</th>
<th>Goat sausages</th>
<th>Significant level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lightness (L)</td>
<td>28.5 ± 0.50c</td>
<td>31.80±0.26b</td>
<td>32.15±1.03b</td>
<td>**</td>
</tr>
<tr>
<td>Redness (a)</td>
<td>10.40 ± 0.50</td>
<td>11.43±0.51</td>
<td>11.56±0.51</td>
<td>NS</td>
</tr>
<tr>
<td>Yellowness (b)</td>
<td>7.67 ± 0.31</td>
<td>8.48±0.50</td>
<td>8.56±0.59</td>
<td>NS</td>
</tr>
<tr>
<td>Water holding capacity (WHC)</td>
<td>0.48 ± 0.17b</td>
<td>1.06±0.21*</td>
<td>0.69±0.17b</td>
<td>*</td>
</tr>
<tr>
<td>Cooking loss %</td>
<td>24.12 ±0.83c</td>
<td>22.02±0.03b</td>
<td>21.2±0.78b</td>
<td>**</td>
</tr>
<tr>
<td>pH</td>
<td>5.65 ±0.21</td>
<td>5.73±0.11</td>
<td>5.66±0.07</td>
<td>NS</td>
</tr>
</tbody>
</table>

* = (P< 0.05)  
** = (P< 0.01)  
*** = (P<0.001)  
N.S. = No significant difference between the two means.

Figure (1): Some quality attributes for different types of sausage

III. DISCUSSION

In the present study the results showed that the Hunter lightness (L) values were highly significant (P< 0.001) between three types of sausage studied. Goat sausages recorded higher values compared to beef and camel sausages as (32.15, 31.8 and 28.5) respectively. Also Redness (a) values were not significant (P>0.05) different. Goat sausages recorded higher values followed by beef and camel sausages as (11.56, 11.45 and 10.40) respectively. Similarly yellowness (b) values were not significant (P< 0.001) different. The goat sausages recorded higher value followed by beef and camel sausages as (8.56, 8.48 and 7.67) respectively. The value of lightness in camel and beef sausages in this study were (28.5 and 32.15) respectively which was less than the values reported by Nafiseh, et al., (2010) as (66.6 and 68.6) for camel and beef sausages respectively. These
results are comparable to the statement of Babiker et al., (1990) who stated that goat meat was darker red in color. The result of redness in this study was slightly less than the value reported by Nafiseh, et. al., (2010) who reported that the redness value in camel sausage was (13.9) and in beef sausage was (9.2), where as the yellowness value in camel sausage was (15.8) and in beef sausage as (15.6). In the present study water holding capacity (WHC) was highly significant (P< 0.01) among the three types of sausage studied. Camel sausages recorded low value (0.48) compared to beef and goat sausages as (1.06 and 0.69) respectively. (Which means camel sausage had highest water holding capacity compared to beef and goat sausages). The goat sausage had WHC of (0.69) which was higher to that reported by Babiker, et al., (1990) as (0.27) and slightly higher value reported of beef sausage as (0.80). In the present study the result showed that cooking loss was highly significant (P< 0.01) among the three types of sausage (camel, beef and goat sausages). Cooking loss percent of camel sausage was higher compared to beef and goat sausages as (24.12, 21.45 and 22.0%) respectively. Camel sausage in this study recorded cooking loss percent as (24.12%) which was in line with the result reported by Nafiseh, et. al., (2010) as (24%). Beef sausage in this study had cooking loss percent as (21.45%) which was slightly similar to that reported by Ali, (2012) as (22%). The present result showed that camel and goat sausages were recorded higher cooking loss compared to beef sausage which was disagreed with the findings of Ali, (2012) who reported that goat sausage had lower cooking loss as (16.64%) compared to beef sausage which showed (22.07%). The value of goat cooking loss in this study was higher than the findings of Gadiyaram and Kannan, (2004) as (5.52%) and in beef sausage as (19.88%). The present result disagreed with the findings of Nafiseh, et. al., (2010) who reported that the camel sausage had lower cooking loss than beef sausage as 24.2 and 30.2% respectively. The difference in cooking loss could be attributed to the denaturation temperature of protein and the difference in chemical properties and types of meat as stated by Dawood, (1995) and Nafiseh, et. al., (2010). The type of fillers affected significantly (P<0.01) on cooking loss %. The sweet potato showed high cooking loss compared to bread crumbs. However, using of sweet potato leads to reduced size of sausage fingers and diminished weight. Therefore, these findings affected economically on sausage marketing. There was no significant (P> 0.05) different between the three types of sausage in pH values. In this study the pH values were (5.65, 5.73 and 5.66) for camel, beef and goat sausages respectively. The pH value in camel sausage (5.56) was agreed with the findings of Nafiseh, et. al., (2010) who reported the pH value in camel sausage as (5.7). The pH result in this study was in line with the result of Wensvoort et al., (2004) who reported the pH in camel and beef sausages was (5.5). Also similar result was reported by Nafiseh, et. al., (2010) as (5.6) in beef sausage. In this study goat sausage had similar pH (5.66) as beef sausage (5.73), similar findings was recorded by Dharmaveer, et al., (2007) as (6.44) and Abbas, (2009) as (5.61) for goat and beef sausages.

IV. CONCLUSION

The results in this study were showed that camel sausage had higher cooking loss compared to beef and goat sausages. Also Water Holding Capacity in camel sausages recorded the lowest values (0.48) compared to beef and goat sausages.

REFERENCES


