THE EFFECT OF DIFFERENT COOKING PROCESS ON MICROBIOLOGICAL QUALITY OF KOKOREC

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Abstract

In this research, totally 180 kokorec samples which 60 raw, 60 grilled and 60 tandir ovened were investigated certain microbiological parameters. Average total mesophilic aerobic bacteria (TMAB), coliform and coagulase (+) S. aureus counts were found as 3.8x10⁴, 2.2x10⁴ and 3.2x10⁴ cfu/g in raw samples, respectively. Also, the results were found to be positive for E. coli, E. coli 0157:H7, C. perfringens and Salmonella spp. as 60 (100%), 9 (15%), 18 (45%) and 54 (90%) in raw samples, respectively. On the other hand, it was determined that average TMAB, coliform and coagulase (+) S. aureus counts in grilled and tandir ovened samples were 1.2x10⁴, 5.7x10⁴, 1.2x10⁴ cfu/g and 2.3x10⁴, 8.6x10⁴, 3.1x10⁴ cfu/g, respectively. No E. coli 0157:H7 and C. perfringens were determined in grilled and tandir ovened kokorec samples, while the results were only found to be positive for E. coli and Salmonella spp. as 3 (5%) in these samples. Also, it was found to be positive for E. coli as 24 (40%) and Salmonella spp. as 42 (70%) in tandir ovened kokorec samples.

Keywords: Food Hygiene, Public Health, Offal, Kokorec, Microbiological Quality

1. INTRODUCTION

Meat is obtained from sheep and cattle farm animals, poultry, seafood and of various game animals of the skeletal muscle and internal organs by slaughter, fragmentation and processing. Offal also parts of a meat animal which is used as food but which are not skeletal muscle and it covers insides including the heart, liver, and lungs, all abdominal organs and extremities, tails, feet, and head including brains and tongue [1]. Although internal organs of slaughter animals contain more water, contains less fat compared to red meat. On the other hand, while red meat contain very little carbohydrate, most of the internal organs provides high carbohydrate rate [2]. While not achieving a strong acceptance by consumer, offal represent an excellent source of proteins, vitamins, and minerals [3].

Kokorec, an offal product, is prepared from fresh and washed lamb or mutton intestines around mesenterial fat and cooked in different ways; grilled, fried, boiled or tandoori cooked. The most popular cooked process is that wrapped intestines around a skewer are grilled horizontally on a charcoal fire which gives it an extra rich flavor and chopped, seasoned with salt, pepper and oregano, and served on bread.

It has been reported by various researchers that meat and meat products may contain pathogens such as Clostridium, Campylobacter, Listeria, E. coli, Salmonella, Brucella and Staphylococcus because of the ruminants as it includes various pathogens of intestinal flora [4, 5, 6]. It may include the potential health risks if not carried out completely the essential hygiene and sanitation conditions and/or adequate cooking process during the preparation of the intestine. These health risks are microbiological character. In Turkish Food Codex Communiqué on Microbiological Criteria, in meat and meat products, Salmonella, E. coli O 157 and Listeria monocytogenes (L. monocytogenes) must be negative in 25 g sample and the number of total mesophilic aerobic bacteria (TAMB) must be no more than 5x10⁶ g sample [7].

In this study, it was investigated the certain microbiological parameters of raw kokorec samples made in a specific slaughterhouse and their samples prepared with two different cooking methods as grilled and tandir ovened.

2. MATERIALS AND METHODS

In October-April period, it was taken monthly 60 kokorec samples each about 1 kg cleaned and skewered. Each sample was prepared in 3 different skewers, totally 120 samples. First skewers for raw samples, second and third skewers after grilled and tandir ovened were brought to the laboratory under sterile bags and cold chain. Samples were stored in the refrigerator at 4 ± 2 °C during the analysis. Some physicochemical properties of the raw kokorec samples are summarized in Table 1.

Dry matter, protein content, fat rate and the amount of ash of example were determined according to ISO [8, 9, 10, 11]. For microbiological analysis, sample preparation, TMAB, coliform and E. coli, Salmonella, S. aureus and C. perfringens were determined according to FDA BAM [12, 13, 14, 15, 16, 17]. Also E. coli 0157:H7 was determined according to Luciano et al., [18].
Table-1: Some physical-chemical properties identified in samples of raw kokorec (n=60)

<table>
<thead>
<tr>
<th>Matter (%)</th>
<th>Fat (%)</th>
<th>Protein (%)</th>
<th>Ash (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum</td>
<td>23.65</td>
<td>8.12</td>
<td>14.34</td>
</tr>
<tr>
<td>Minimum</td>
<td>20.47</td>
<td>6.12</td>
<td>11.57</td>
</tr>
<tr>
<td>Average</td>
<td>21.85</td>
<td>7.00</td>
<td>12.97</td>
</tr>
</tbody>
</table>

n= the number of examined samples

3. RESULTS

Microbiological quality characteristics of raw, grilled and tandir ovened samples are presented in Table 2. The number of TAMB were found between 1.2 x 106 and 1.2 x 108, and to average of 3.8 x 107 cfu/g in raw sample, between 1.1 x 105 and 6.0 x 104, and to average 2.3 x 104 cfu/g, respectively.

Coliform bacteria counts were found between 1.0x103 and 8.4x104, and to average of 2.2x104 cfu/g in the raw samples. Also coliform bacteria counts were found as average of 5.7x101 and 8.6x101 cfu/g in grilled and tandir ovened samples, respectively.

Coagulase (+) S. aureus was detected between 1.5 x 103 and 0.6 x 103, <1.0 x 101 and 8.9 x 102, and 2.5 x 101 and 3.1 x 102 in raw, grilled and, tandir ovened samples, respectively. While E. coli was detected in all raw samples, E. coli 0157:H7, C. perfringens and Salmonella were detected in 9 (15%), 18 (45%) and 54 (90%), respectively. As E. coli and Salmonella were detected in 3 (5%) in grilled samples, E. coli 0157:H7 and C. perfringens were not detected in any of the grilled samples. On the other hand, it was detected E. coli in 24 (40%) and Salmonella in 42 (70%) in tandir ovened samples. Also E. coli 0157:H7 and C. perfringens were not detected in any of the tandir ovened samples.

4. DISCUSSION

In a research, Salmonella was identified in 2 (4%) raw and in 6 (12%) cooked offal samples consists of brains, cheeks, tongue, tripe and liver [19]. Also Ulutürk were found positive for Salmonella in 40% brain, 24% spleen, 20% liver, 20% lungs, 20% tripe and 12% heart out of 150 raw offal samples [20]. According to the results of another research, while TMAB, coliform and E. coli were detected as between 105-107; 104-107 and 106-107 cfu/g in raw kokorec samples, respectively. In the same study, S. aureus and Salmonella were not detected in any of the samples [21]. Hampikyan et al. found TMAB, coliform, E. coli and S. aureus as between 5.3x103-7.0x105; <1.0x101-2.1x104; <1.0x101-6.6x102 and <1.0x102-4.8x103 cfu/g in 15 grilled kokorec samples presented for consumption in Istanbul, respectively. Also, there was not detected Salmonella in any of the samples in the same study [22]. In a research on microbiological quality of kokorec presented in Afyonkarahisar for consumption, TAMB, Enterobacteriaceae, coliform, E. coli, Enterococcus spp., Staphylococcus/Micrococcus and yeasts and moulds were found as 1.9x106, 2.2x104, 2.7x102, 1.2x102, 1.5x104, 7.1x102 and 7.8x105 cfu/g, respectively [23].

Table-2: The microbiological characteristics of raw, grilled and tandir ovened kokorec samples (n=60)

<table>
<thead>
<tr>
<th>Samples</th>
<th>Microorganism</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Average</th>
<th>Positive number (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw 60</td>
<td>E. coli</td>
<td>1.2x10⁹</td>
<td>1.2x10⁸</td>
<td>3.8x10⁷</td>
<td>60/60 (100)</td>
</tr>
<tr>
<td></td>
<td>E. coli 0157:H7</td>
<td>9/60</td>
<td>18/60</td>
<td>54/60</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C. perfringens</td>
<td>3/60</td>
<td>0/60</td>
<td>3/60</td>
<td>(5)</td>
</tr>
<tr>
<td></td>
<td>Salmonella spp.</td>
<td>0/60</td>
<td>0/60</td>
<td>0/60</td>
<td>(0)</td>
</tr>
<tr>
<td>Gerilled 60</td>
<td>E. coli</td>
<td>5.5x10²</td>
<td>&lt;1.0x10¹</td>
<td>1.2x10³</td>
<td>3/60 (5)</td>
</tr>
<tr>
<td></td>
<td>E. coli 0157:H7</td>
<td>0/60</td>
<td>0/60</td>
<td>0/60</td>
<td>(0)</td>
</tr>
<tr>
<td></td>
<td>C. perfringens</td>
<td>0/60</td>
<td>0/60</td>
<td>0/60</td>
<td>(0)</td>
</tr>
<tr>
<td></td>
<td>Salmonella spp.</td>
<td>0/60</td>
<td>0/60</td>
<td>0/60</td>
<td>(0)</td>
</tr>
<tr>
<td>Tandir Ovened 60</td>
<td>E. coli</td>
<td>6.0x10²</td>
<td>1.1x10¹</td>
<td>2.3x10²</td>
<td>24/60 (40)</td>
</tr>
<tr>
<td></td>
<td>E. coli 0157:H7</td>
<td>0/60</td>
<td>0/60</td>
<td>0/60</td>
<td>(0)</td>
</tr>
<tr>
<td></td>
<td>C. perfringens</td>
<td>0/60</td>
<td>0/60</td>
<td>0/60</td>
<td>(0)</td>
</tr>
<tr>
<td></td>
<td>Salmonella spp.</td>
<td>42/60</td>
<td>(70)</td>
<td>(70)</td>
<td></td>
</tr>
</tbody>
</table>

* n: examined sample number
* Numbers detected in the detection limit was evaluated as positive.
In this research, the presence of E. coli in all, E. coli O157: H7 in 15% (9/60), C. perfringens in 45% (27/60) and Salmonella in 90% (54/60) raw samples indicates that the cleaning was not enough during the sample preparation. Also, according to these results, it has been shown that the most effective cooking process is grilled. The presence of E. coli in 40% (24/60) and Salmonella in 70% (42/60) demonstrated that the heat treatment was not enough in tandir ovened cooking.

3. CONCLUSIONS

It is necessary to comply with the hygiene processes during the preparation and cleaning of intestine because of kokorec is likely to be contaminated with enteric microorganisms as of natural structure. In addition, the temperature should be to reach the midpoint of product in the cooking process for inhibition of pathogens likely to be found in raw product.

REFERENCES