The Influence of Chopping Duration on the Degree of Proteins Extraction

Daniela Ianiţchi, Lucica Nistor, Gratziela Victoria Bahaciu, Camelia Hodoşan, Laura Urdeş, Vasile Băcilă

Faculty of Animal Sciences, 011464, Bucharest, Mârăştii 59, Romania

Abstract
The quality of meat preparations, in terms of binding compositions, is directly influenced by the degree of extractibility of structural proteins, which in turn is influenced by a number of factors such as quality of raw and auxiliary materials, how various operations are conducted the technological process, type of equipment used, etc. This paper aims to follow how the degree of extractibility of sarcoplasmic and myofibril proteins it is influenced by chopping and the type raw material. From experiments it was found that the degree of extraction of proteins increases with increasing chopping to a time when extracting a slight regression. For the same chopping stroke by degree of extraction is higher for samples obtained from pork and the evidence obtained by adding water cooled.

Keywords: chopping, myofibrillar proteins, sarcoplasmic proteins

1. Introduction
Transforming meat in cooked meat products is influenced by a number of parameters regarding the quality of raw materials (meat structure, the ratio between conjunctive tissue, fat and muscle tissue), auxiliary materials, technological processes applied and the performance of machines used. Optimal binding compositions is favored by the extraction of structural protein in an advanced degree, that after heat treatment, the changes they support, will act as binders for the components [1, 2]. So a high degree of myofibril protein extraction will lead to the acquisition of quality dishes with appropriate succulence, tight structure, which performs well at slicing, forming coagulated protein matrix which embedded water, fat and aids [3].
Paper aims to examine how they influence the operation of chopping (chopping operation duration and conditions for achieving this) the degree of extraction of myofibrillar and sarcoplasmic proteins.

2. Materials and methods
Determining the degree of extraction of sarcoplasmatic and myofibrillar proteins according to the degree of chopping was done on the composition of beef and pork with and without added water cooled. When used without adding water mixtures cooled, the composition was made up of muscle tissue 65% and 35% fat and added water when cooled, the composition was made up of muscle tissue of 50%, 27% fat and 23 % water cooled. Chopping was done in laboratory conditions, using the robot Blixer 3, at 3000 rpm, for durations of 15 seconds, 30 seconds, 45 seconds and 60 seconds, samples are introduced to shredding at a temperature of 3°C. Quantitative determination of sarcoplasmic protein was done by Kjeldahl method after extraction with 0.15 M KCl solution, 1mm EDTA, used in proportion of 1:5 and centrifugation at 3000 rot./min. Myofibril nitrogen was determined by the Kjeldahl method.

* Corresponding author: Daniela Ianiţchi, Tel: +40(21) 3182266, dianitchi@yahoo.com
after protein extraction with 1.1 M KI solution, 0.5 M KCl and centrifugation at 3000 rot./min.[4].

3. Results and discussion

For mincing meat with added water cooled, it was found that increasing chopping, favors both sarcoplasmic proteins and myofibrillar proteins until chopping duration of 45 seconds, this increase is the result of destruction of muscle structure. Increasing the duration of chopping to 60 seconds causes a reduction of extraction for both sarcoplasmic and myofibrillar proteins. This reduction in extraction with increasing chopping time can be explained by increasing the temperature to cause partial denaturation of the proteins, the expulsion of large quantities of fat in fat cells due to advanced shred and forming a hydrophobic film on the surface granules meat and some lipoprotein complex, which disrupts the extraction process. The amount of sarcoplasmic and myofibrillar proteins extracted from the mixture plus water cooled, cast the 100g test sample are presented in tab. 1 and fig. 1.

The mixtures on the chopping beef and pork without adding water cooled it was found that increasing sarcoplasmic and myofibrillar proteins extraction chopping favor by chopping duration of 45 seconds, but the quantities extracted are lower compared with mixtures that have content and water cooled. This reduction in extraction, if compositions obtained without the addition of cooled water, can be explained by a higher temperature during the chop, which affects the structure of proteins and extraction. Increasing the duration of chopping to 60 seconds causes a reduction of extraction, for both sarcoplasmic and myofibrillar proteins, the quantities obtained in this situation are lower than when used to achieve composition and water cooled. The amount of protein extracted from mixtures without added water cooled, cast the 100g test sample are presented in tab. 2 and fig. 2.

Table 1. Extraction of proteins from mixtures based beef and pork with added water cooled

<table>
<thead>
<tr>
<th>Type composition</th>
<th>Protein content,%</th>
<th>Chopping time, s</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>Pork meat</td>
<td>Sarcoplasmic proteins</td>
<td>3.81</td>
</tr>
<tr>
<td>with water</td>
<td>Myofibrillar proteins</td>
<td>5.17</td>
</tr>
<tr>
<td>Beef meat</td>
<td>Sarcoplasmatic proteins</td>
<td>3.75</td>
</tr>
<tr>
<td>with water</td>
<td>Myofibrillar proteins</td>
<td>5.08</td>
</tr>
</tbody>
</table>

Figure 1. Extraction of proteins from mixtures based beef and pork with added water cooled to the length of chop.
Table 2. Extraction of proteins from mixtures based beef and pork without adding water cooled

<table>
<thead>
<tr>
<th>Type composition</th>
<th>Protein content, %</th>
<th>Chopping time, s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pork meat with water</td>
<td>Sarcoplasmic proteins</td>
<td>3.63</td>
</tr>
<tr>
<td></td>
<td>Myofibril proteins</td>
<td>4.59</td>
</tr>
<tr>
<td>Beef meat with water</td>
<td>Sarcoplasmic proteins</td>
<td>3.47</td>
</tr>
<tr>
<td></td>
<td>Myofibril proteins</td>
<td>4.27</td>
</tr>
</tbody>
</table>

a) Changes in sarcoplasmic protein concentration
b) Changes in myofibril protein concentration

Figure 2. Extraction of proteins from mixtures based beef and pork without adding water cooled, depending on the duration chopping

Experiments showed that if the compositions obtained by adding water and cooled for those obtained without added water, although the protein content of beef muscle tissue is higher, they extract larger quantities of structural proteins for compositions based on pork, the phenomenon can be explained by greater muscle fiber fineness pig, which presents a less hard tissue and small particles formed by chopping a larger area of contact with the liquid phase.

4. Conclusions

Increasing the extraction of sarcoplasmic and myofibrillar proteins by chopping favor at a time when extracting a slight regression; extraction increase with increasing chopping time is the result of destruction of muscle structure, while reducing the extraction times greater than chopping can be explained by increasing temperature, the partial distortion of protein and complex formation of lipoprotein prejudicial extraction.

The same chopping times, the degree of extraction of protein is higher for mixtures of pig meat compared to beef.

For the same chopping times the degree of extraction increases for samples with added water cooled, compared with samples without added water cooled.

References