The changes in some functional and sensory attributes in vacuum packed Mullard muscles as affected by ageing in chilling temperature

Einfluss der Reifung während der Kühlung auf die Veränderungen einiger funktionaler und sensorischer Eigenschaften von Vakuum-verpacktem Mulardenfleisch

Teresa Skrabka-Blotnicka, Ewa Przysiężna and Janina Wołoszyn


Introduction

Mullard ducks, i.e. the hybrids of the Muscovy male and the Pekin female duck, have not only been force fed for “foie gras” production but also for improving of the sensory and the nutritive value of meat (Baeza et al., 1999, Hoffman and Canning, 1995, Książkiewicz, 1993). In some countries, as for example in France, the drakes have been force fed only for obtaining “foie gras” (economic reason). In other countries both sexes have been fed for obtaining both “foie gras” and very tasty meat. The kosher smoked products (ham, backon and sausages) have been processed from meat of force fed Mullards in Israel. These products look like lean smoked pork and are very tasty (Hoffman and Canning, 1995). Therefore, the processing of this kind of meat should be expanded.

At present, most of Mullard carcasses are dissected. The leg and breast portions are vacuum-packed and kept under cooling conditions until sale. From the customers point of view the following properties are extremely important for the raw ducks’ meat: colour, smell, cooking losses and water holding capacity, and for heat treated meat: taste, smell, tenderness, juiciness, toughness.

The colour of poultry meat is a very important attribute from both the consumers and the processors point of view. The colour of meat is recognized as an indicator of meat freshness. Very often consumers base their decision for either acceptance or rejection of meat on the impression of colour. The impression of colour is caused by diffusion and absorption of light falling on the surface. However, the shade of colour depends on kind and concentration of pigments. Three factors are responsible for meat colour: physical structure of meat, pigments’ concentration and chemical state of pigments (Millar et al., 1993, Renerre, 1999). Three myoglobin forms, oxymyoglobin (MbO₂), myoglobin (Mb) and metmyoglobin (MMb) are the main pigments in well-bled muscles responsible for colour. The factors affecting the quantity of haem pigments in poultry meat are: kind of birds and muscles (Pikul et al., 1993), age (Pngel et al., 1991), sex (Pikul et al., 1987) and ante and post mortem factors (Fletcher, 1991 and 1992, Renerre, 1999, Uitittenboogaart, 1991). The factors which affect fresh meat colour are: gaseous atmosphere, temperature, humidity, pH, chemicals, light and microorganisms (Solberg and Franke, 1971). Depending on time and temperature as well as on availability of oxygen the Mb can form either MbO₂ — bright red (attractive) or MMb — brown (unattractive) colour of meat. Renerre (1999) reported that the rate of MMb accumulation on the surface of meat depends on such factors as: pH, muscle metabolic type, kind and age of animal, breed, sex, diet, temperature, oxygen availability, type of lighting, microbial growth, storage method (air, modified atmosphere, vacuum), or by a combination of several factors. It was found out that lightness (L*) and redness (a*) is correlated with the intensity of pink red colour (evaluated by sensory panel) and oxy- and metmyoglobin content in fresh muscles from force fed Mullards (Wołoszyn et al., 1997). Furthermore, it was discovered that the relationship between either L* or a* parameters and oxymyoglobin is opposite to the relationship between L* or a* and metmyoglobin content in the ducks’ muscles comprising total haem pigments and myoglobin on the same level (Wołoszyn et al., 1997).

It is generally known that the functional and sensory attributes of meat are influenced by the following factors: pH, kind and biochemical state of muscles, microorganisms, chemicals, and environmental parameters, especially temperature and composition of atmosphere including humidity. Wołoszyn (2002) reported in her paper on physicochemical and technological characteristic of muscles of force fed Mullard ducks among other things that:

1. The muscles of males, especially breast muscles were characterized by large differentiation in colour in spite of the same level of total haem pigments as in females.
2. There are relationships between L* or a* parameters and ratios of oxymyoglobin and metmyoglobin to myoglobin contents that are well described by the second degree polynomial.
3. The sensory profiles of roasted leg and breast muscles of ducks can be described by 7 descriptors (flavour of roasted duck meat, flavour of duck fat, juiciness, toughness, elasticity, tenderness, fatness) and general sensory evaluation of muscles amounting to 9.1 [CU] (breast) and to 7.25 [CU] (leg).
4. The breast muscles of drakes were characterized by lower values for cooking losses (14.1%) and higher values for holding water capacity (105%) and texture (38.2 N) than in leg muscles (19.2%, 86.2% and 35.9 N, respectively).

There are no data showing the influence of time of storage under cooling conditions on the physicochemical proper-
ties and sensory profile of vacuum packed muscles of force fed ducks. Therefore, the objective of the study was set to investigate the influence of ageing at +1°C on changes in sensory profiles and texture (roasted muscles) and water holding capacity, cooking losses, pH, colour and haem pigments' concentration (raw muscles) of vacuum packed Mullard drakes' muscles.

This contribution is part of the work on the changes in the meat quality of force fed Mullard drakes caused by ageing in vacuum packing at +1°C. Earlier contributions refer to microbiological contamination and smell (Kosek et al., 1998) and proteolytical and oxidative changes (Przysieznà, 1999).

Materials and methods

As experimental material breast and leg muscles of 12-week old industrially killed drakes was used. The birds were force fed with corn for 15 days before slaughter. The leg and breast portions (with skin and with bones) were vacuum packed into PA/PE bags 24 h after the slaughter using the "Multivac packer".

The samples were stored in a refrigerator at +1°C for 1, 6, 13 and 18 days (breast) and for 1, 5 and 11 days (leg), respectively. The tests were conducted on 6 separate days, the experiment was repeated once. The time of storage was limited by count of bacteria determined by Kosek et al. (1997). The breast and leg muscles were not examined at the same time, except for duration of storage of one day. Breast muscles were investigated first. Considering the fact, that the leg muscles stored for 1 day were more contaminated than the breast muscles, the time of storage between sequential examinations was cut in relation to breast muscles.

The sensory assessment (SE) of the surface colour of raw muscles was conducted by 7 trained testers using the sensory profile technique according to ANALSESS NT programme developed by Barylko-Caret Ltd. The following scale was used: 1- very light pink, 2- light pink, 3-pink, 4- dark pink, 5- light red, 6- red, 7- dark red.

The sensory profiles of roasted meat were established by the sensory panel of 7 trained testers who have been characterized by high sensory susceptibility using the Quantitative Descriptive Analysis technique. The ANALSESS NT programme was used with a 10 point scale, where 0 means "not at all" and 10 means "very much so". The intensity of descriptors was expressed in conventional units [CU] (Stone et al., 1974 and 1980). The examinations were carried out at the air conditioned laboratory at 18°C. The samples for sensory assessment of roasted muscles were prepared in the following way: the whole muscles were wrapped into aluminium foil and roasted at 190°C to 85°C in the centre of samples in the electrical oven. Next they were cooled and stored at 4°C for 24h until examination. Then the muscles were cut into pieces and given to assessment in a randomly coded sequence. The following descriptors were determined: smell of bouillon, flavour of ducks' fat, characteristic flavour for roasted meat, characteristic flavour for boiled meat, other taste, juiciness, toughness, elasticity and general evaluation.

The following attributes were determined additionally after ageing for 18 days (breast) and 11 days (leg). The pH was measured with the digital pH-meter MERATRONIC – 517 by direct coupled electrode insertion into ground meat. Water holding capacity (WHC) was determined according to the Utility Pattern of Polish Patent Of-

fice no 40767. Cooking losses (CL) were determined according to procedure described by Lestów et al. (1992). Texture was determined as shear force (SF) as follows: bars of 1 x 1 x 5 cm were sliced from roasted muscles in parallel with muscles' fibres and were sheared across fibres using the WARNER-BRATZLER's shearometer DS/n 8476 GRAF ZWMP. Ponzini with one knife system. The speed of traverse amounted to 8.5 cm/min.

The haem pigments were extracted using the procedure described by Pikuł (1993). The muscles were frozen at –18°C for 24h and subsequently (without thawing) cut in thin flakes that were mixed. About 10 g of samples were homogenised with 50 cm³ of phosphate buffer (pH 6.8) at 4–6°C for 1 minute at 3000 rpm. The homogenate was stored at 4–6°C for 1h. After that period the homogenate was centrifuged at 4000 x g for 10 minutes. The supernatant was decanted and the remainder was extracted once more with 42.5 cm³ of the above mentioned buffer and centrifuged (in the same conditions as previously). The both supernatants were mixed exactly and the volume was measured. The extract was centrifuged at 30000 x g for 1h and filtered with the Whatman 1 paper filters. The absorbance was measured at 525, 545, 565, and 572 nm using the Hewlett Packard's Diode Array UV/VIS spectrophotometer. The TP Mb, MbO₂, MMb concentration and relative concentrations of Mb, MbO₂, MMb were calculated with the equations given by Krzywicki (1982).

Lightness (L*) redness (a*) and yellowness (b*) were measured with the CHROMAMETER Minolta CR310. The ratio a*/b* which was determined as the degree of discolouration of meat inoculated with P. fragi by Bala et al. (1997), was calculated.

The obtained data were statistically analysed. The Bartlett's test was used to check homogeneity of variances. The Duncan's multiple range test - recommended by Bozýk and Rudzki (1977) for the use in food analysis - was used for forming homogeneous groups of average values within each kind of muscle.

Results

Before starting with the presentation of the results it has to be indicated that in the present case the term myoglobin is not only used for the pure chemical substances but a mixture of myoglobin and hemoglobin generally expressed as myoglobin.

The breast muscles from Mullard drakes contained more TP, Mb, MbO₂ and MMb expressed in mg/g of tissue than leg muscles. On the other hand, the relative concentration of Mb, MbO₂, and MMb in both kinds of muscles were similar (Table 1). The concentrations of total pigments and the three myoglobin forms were on the same level during storage at +1°C of the vacuum packed breast and leg muscles for up to 6 and 5 days, respectively. After that period a decrease in the concentration of TP, Mb and MbO₂ was observed in both kinds of muscles and of the MMb in the leg muscles. However, the MMb concentration in the breast muscles remained unchanged. During storage longer than 5 (leg) or 6 (breast) days the relative concentration of the Mb, and MbO₂ decreased and the MMb increased in both kinds of investigated muscles. The leg muscle colour from force fed Mullard drakes was defined by the sensory panel as pink red, whereas the breast muscle colour was defined as light red (Table 2). The L* values were higher and the a* and b* values were lower in leg muscles than in breast muscles. Among the colour parameters only yellowness increased significantly before
Table 1. Haem pigment concentration as affected by ageing

<table>
<thead>
<tr>
<th>Time days</th>
<th>TP</th>
<th>Mb</th>
<th>MbO₂</th>
<th>MMb</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C</td>
<td>SD</td>
<td>C</td>
<td>SD</td>
</tr>
<tr>
<td>breast muscles</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>4.63&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.44</td>
<td>39.3</td>
<td>1.82&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>6</td>
<td>4.78&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.28</td>
<td>38.9</td>
<td>1.86&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>13</td>
<td>3.04&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.33</td>
<td>32.9</td>
<td>1.00&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>18</td>
<td>2.08&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.35</td>
<td>25.5</td>
<td>0.53&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

leg muscles |    |    |      |     |     |     |     |     |
| 1         | 2.96 | 0.19 | 37.2 | 1.10<sup>b</sup> | 0.14 | 34.8 | 1.03<sup>b</sup> | 0.12 | 26.0 | 0.78<sup>b</sup> | 0.07 |
| 5         | 2.83<sup>a</sup> | 0.28 | 35.7 | 1.01<sup>b</sup> | 0.11 | 34.3 | 0.97<sup>b</sup> | 0.13 | 26.0 | 0.75<sup>b</sup> | 0.11 |
| 11        | 1.48<sup>b</sup> | 0.29 | 29.1 | 0.43<sup>a</sup> | 0.08 | 24.3 | 0.36<sup>a</sup> | 0.08 | 36.5 | 0.54<sup>a</sup> | 0.10 |

The data are average values of 24 tests (12 muscles x 2 tests)

TP - total pigment
C - concentration mg/1g of tissue
RC - relative concentration %
SD - standard deviation
a, b - values with different letter, differ at P < 0.05 within the time of storage and kind of muscles

13 days of storage in breast muscles. The a*/b* ratio decreased significantly in the same time. On the other hand the time of storage did not influence significantly the colour parameters in leg muscles, although a slight continuous increase in b* values was observed.

The sensory profile of roasted muscles of Mullard drakes covered 9 descriptors that did not change significantly during ageing till 13<sup>th</sup> (breast) and 6<sup>th</sup> (leg) day (Figures 1 and 2). The general evaluation of roasted vacuum packed and aged muscles was higher for breast (8.0-9.0 CU) than for leg muscles (7.14-7.27 CU). The lower general evaluation of roasted leg muscles than breast muscles resulted from lower tenderness (5.2-5.4 CU) and higher toughness (3.7-3.8 CU) of leg muscles than breast muscles (8.0-8.2 and 1.5-1.6 CU), respectively.

The cooking losses and pH did not change during storage for both kinds of muscles (Table 2). The same was due to WHC in leg muscles. On the other hand, the increase in L* during storage was higher for breast muscles.

Table 2. Physicochemical properties of drakes' muscles as affected by ageing

<table>
<thead>
<tr>
<th>Time [days]</th>
<th>1</th>
<th>6</th>
<th>13</th>
<th>18</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>SD</td>
<td>X</td>
<td>SD</td>
</tr>
<tr>
<td>breast muscles</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td>5.49</td>
<td>0.09</td>
<td>5.57</td>
<td>0.09</td>
</tr>
<tr>
<td>CL [%]</td>
<td>20.80</td>
<td>2.22</td>
<td>17.90</td>
<td>1.72</td>
</tr>
<tr>
<td>WHC [%]</td>
<td>60.75&lt;sup&gt;a&lt;/sup&gt;</td>
<td>5.38</td>
<td>66.28&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.38</td>
</tr>
<tr>
<td>SF [N]</td>
<td>37.70&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.03</td>
<td>36.70&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.06</td>
</tr>
<tr>
<td>L*</td>
<td>41.79&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2.35</td>
<td>38.33&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2.83</td>
</tr>
<tr>
<td>a*</td>
<td>22.30</td>
<td>2.04</td>
<td>6.90</td>
<td>3.04</td>
</tr>
<tr>
<td>b*</td>
<td>6.77&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.27</td>
<td>5.41&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.92</td>
</tr>
<tr>
<td>a*/b*</td>
<td>3.29&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.12</td>
<td>3.12&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.74</td>
</tr>
<tr>
<td>SE [CU]</td>
<td>5.42</td>
<td>0.51</td>
<td>5.15</td>
<td>0.74</td>
</tr>
</tbody>
</table>

leg muscle |      |      |      |      |
| pH          | 6.12 | 0.13 | 6.12 | 0.14 | 5.93 | 0.08 |
| CL [%]      | 24.25 | 2.56 | 22.67 | 0.71 | 24.22 | 1.81 |
| WHC [%]     | 73.65 | 2.03 | 77.90 | 4.15 | 70.92 | 3.49 |
| SF [N]      | 35.90<sup>a</sup> | 2.70 | 30.50<sup>a</sup> | 3.70 | 18.90<sup>b</sup> | 2.47 |
| L*          | 44.87<sup>a</sup> | 3.24 | 43.56<sup>a</sup> | 6.57 | 34.54<sup>a</sup> | 2.92<sup>a</sup> |
| a*          | 18.16 | 1.92 | 19.30 | 1.86 | 18.21 | 1.86 |
| b*          | 9.40 | 2.29 | 9.80 | 2.30 | 10.07 | 2.09 |
| a*/b*       | 1.93 | 1.69 | 1.60 | 1.80 |
| SE [CU]     | 4.73 | 0.42 | 4.76 | 0.40 | 4.73 | 0.53 |

The data are average values of 9 tests for: pH, CL, WHC, SF; 24 tests for L*, a*, b*; 42 tests for SE (breast) and 18 tests for SE (leg)

X - average values
SE - sensory evaluation of raw meat colour
SD - standard deviation
a, b - values with different letter, differ at P < 0.05 within the time of storage and kind of muscles
WHC of breast muscles aged for 13 days and a decrease in shear force of breast muscles aged for 6 days and for leg muscles aged for 5 days was observed. Obviously, those changes were caused in greater extend by exogenic than by endogenic enzymes. Although significant differences were stated for the shear force value after 13 days of breast muscles storage (Table 2), tenderness evaluated by the sensory panel was not different. Probably, the difference in shear force value (6.4N) was not sufficiently extended to causing evident changes in the sensoric feeling.

**Discussion**

The determined concentrations of TP, Mb and its derivatives were comparable to data given by WOŁOSZYN.
(2002) for Mullard muscles investigated 24 h after killing. From the obtained data results that all forms of myoglobin were not involved in oxidation – reduction mechanisms in the first stage of storage (5 days – leg muscle, 6 days – breast muscle), although lipid oxidation was noted in this time (PRZYSJEZNA, 1999). The increase of TBA by 56% (breast) and by 230% (leg) was found after storage for 6 days (breast) and 5 days (leg), respectively. Many authors have shown that lipid oxidation was a promotor of myoglobin oxidation in bovine muscles (RENERRE, 1999). A strong relationship was found by KRZYWICKI (1982) between lipid oxidation measured by TBA – RS and by MB% on the beef meat surface during an aerobic storage. Probably, the extend of lipid oxidation was not sufficient in this case to promote myoglobin oxidation in vacuum packed meat. Under the experimental conditions the concentration of MMb in breast muscles did not change up to the 18th day of storage, as it is formed from Mb or MbO2 in a non enzymatic spontaneous oxidation (RENERRE, 1999). On the other hand the mechanisms of MMb reduction acting in vivo may have been stopped in the meat and the psychrotrophic bacteria were in not sufficient number to exhibit proreductive properties. RENERRE (1999) reported that according to FAUSTMANN and CASSENS (1990) 10^8 CFU psychrotrophic bacteria/g are needed to start the reductive properties. In this experiment, the total count of anaerobic bacteria amounted to 2.3 x 10^7 CFU/g after 18 days of storage of breast muscles and 8.8 x 10^6 CFU/g after 11 days of storage of leg muscles (KOSEK et al., 1997). The growth of Pseudomonas fragi affected the Mb, MbO2 and MMb relative concentration in beef inoculated and stored at +1°C (BADLA et al., 1997). The above mentioned authors established a decrease in MbO2 and an increase in MMb relative concentration when the number of Pseudomonas increased. The sulfomycoglobin is formed under vacuum conditions, where the H2S is produced by spoilage bacteria (RENERRE, 1999).

The fact of the decrease in concentration of TP, Mb, MbO2 and either decreased (leg) or unchanged MMb concentration (breast) can build the basis for the conclusion that haem pigments not only or at all undergo oxidation reduction mechanisms in vacuum packed duck muscles. It is most likely that these changes in haem pigments were caused by the interactions of spoilage bacteria' products as the absorbance spectra of the formed derivatives were significantly different from the spectra of haem substrates. Therefore, latter investigation should be conducted for either acceptation or rejection of the above mentioned hypothesis.

The values of colour parameters L*, a* for both kinds of muscles and b* parameter for the breast muscles are on the same level as it was reported by WOLOSZYN (2002) for muscles investigated 24 h after killing. However, b* parameter for the vacuum packed leg muscles is higher (9.40) than that given by WOLOSZYN (2002) (6.23). It is most likely that the change of b* parameter and a*/b* ratio occurred as a result of the bacteria' growth. Significant growth in count of bacteria was observed on the 13th day of breast muscle storage (KOSEK et al., 1997). In spite of the changes in b* values and a*/b* ratios sensory assessment of colour did not change during storage of both kinds of investigated muscles. This can be due to the lower susceptibility of the human eye in comparison to the testing apparatus. Clearly, the changes in b* values have not been sufficient to make the change in the sensory perception of colour evident. It is hard to explain why the colour of muscles did not change while the total pigment concentration was decreased. This question requires further studies as well.

The intensity of assessed sensory descriptors, except flavour of ducks’ fat, contributed to the sensory profile of vacuum packed Mullard muscles and the intensity of descriptors of unpacked muscles (WOLOSZYN, 2002) were on the same level. The intensity of ducks’ fat flavour of vacuum packed muscles was lower than for unpacked muscles. The differences amounted to 1.2 CU (breast) and 2.7 CU (leg). This may be caused by sucking off the volatile substances during vacuum packing.

Comparing the obtained data for 1 day stored vacuum packed muscles with results obtained for the Mullard drakes' muscles examined 24 h after killing (WOLOSZYN, 2002), it should be stated that the values of pH and SF were on the same level in the compared breast and leg muscles, and WHC was lower for vacuum packed muscles. Besides, WHC was higher in leg than in breast muscles. This agrees with results reported by WOLOSZYN (2002). Cooking losses were higher in both kinds of vacuum packed muscles than in other compared muscles. It is very probable that the vacuum packing process caused the above mentioned changes.

**Conclusion**

The observed changes in the total haem pigment concentration and its composition in the vacuum packed Mullard drakes' muscles stored at +1°C did not affect muscle colour as assessed by the sensory panel. Furthermore, also the values of a* and L* parameters and SF were not reflected in the sensory assessment.

The changes in the values of b*, a*/b* ratio, haem pigments' concentration and composition and WHC occurring during ageing of the Mullard drakes' vacuum packed muscles at +1°C has to be assumed as the result of bacteria' interactions. Further studies are needed to confirm this hypothesis. In the same way further studies are necessary for the explanation why the colour of investigated muscles assessed by the sensory panel, L* and a* values did not reflect the changes occurring in heam pigments.

Comparing the data obtained in this work and given by WOLOSZYN (2002) it can be stated that vacuum packing caused the increase in b* value (leg), cooking losses (both kinds of muscles) and the decrease in the intensity of ducks’ fat flavour and WHC (breast and leg muscles).

**Summary**

The changes in some functional and sensory attributes in vacuum packed leg and breast muscles from force fed Mullard drakes stored at +1°C were investigated. The following parameters were determined: 1) intensity of meat colour, 2) total haem pigments (TP), myoglobin (Mb), oxymyoglobin (MbO2) and metmyoglobin (MMb) concentration, 3) colour parameters as lightness (L*), redness (a*) and yellowness (b*), 4) water holding capacity (WHC), 5) pH, 6) cooking losses (CL), 7) texture by shear force (SF) and sensory profiles.

It was established that all investigated traits did not change up to 6 days (breast) or 5 days (leg) of ageing. After that period, it was noted that the concentration of TP, Mb, MbO2 (leg and breast) and of MMb (leg), relative concentration of Mb and MbO2 (leg and breast), SF (leg and breast) decreased, whereas relative concentration of MMb (leg and breast), b* parameter (breast), WHC (breast...
after 13 days) increased. Sensory assessment, L* and a* values (leg and breast) and b* value (leg), pH and CL did not change significantly of during storage.

Further studies are needed to explain: 1) why the colour intensity of the investigated muscles as assessed by the sensory panel and the a* and L* values did not reflect the changes occurring in the haem pigments' concentration, and 2) which interaction caused the changes in haem pigments' concentration.

Keywords
Mullard, meat, quality, muscles, vacuum packed, functional properties, sensory profiles

Zusammenfassung

Einfluss der Reifung während der Kühlung auf die Veränderungen einiger funktionaler und sensorischer Eigenschaften von Vakuum-verpacktem Mulardenfleisch

In dem vorliegenden Projekt wurden bei Vakuum-verpacktem Fleisch die folgenden Parameter bestimmt: 1) Intensität der Fleischfarbe, 2) Konzentration an Gesamthämigmenten (TP), Myoglobin (Mb), Oxymyoglobin (MbO2), Metmyoglobin (MmMb), 3) Farbparameter wie Helligkeit (L*), Rotton (a*), 4) Wasserhaltevermögen (WHC), 5) pH, 6) Kochverluste zum 6. Lagertag (Brustfleisch) bzw. zum 5. Lagertag (Schenkel- und Schenkelkote). Die L* - und a* -Werte (Brust- und Schenkelfleisch), die b*-Werte (Schenkelkote), der pH-Wert und die Kochverluste veränderten sich dagegen auch nach dem 13. Lagertag nicht.

Zusammenfassung

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Weitere Untersuchungen sind zur Klärung folgender Fragen erforderlich: 1) Warum spiegelten weder die sensorische Bewertung (Schenkelfleisch), der pH-Wert und die Kochverluste noch die L* - und a* -Werte die Veränderungen in den Konzentrationen der Hämigmente wider? 2) Welche Interaktionen haben die Veränderungen in der Konzentration der Hämpigmente bewirkt?

Stichworte
Mularden, Fleisch, Qualität, Muskel, Vakuum-verpackt, funktionale Eigenschaften, Sensorische Bewertung

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