

## THE EFFECT OF STORAGE TIME AT +1°C ON THE COLOUR OF VACUUM PACKED DUCK MUSCLES

Teresa Skrabka-Blotnicka, Ewa Przysiezna and Janina Woloszyn

Department of Animal Food Technology, University of Economics, 53-345 Wrocław, Poland

**Keywords:** drake, breast muscle, leg muscle, colour, heam pigment.**Background :**

The colour of meat is often the basis for product selection or rejection by consumers. 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 pigment. Three factors are responsible for meat colour: physical structure of meat, pigment concentration and chemical state of pigments /McDougall in Millar et al. 1996/. Three myoglobin forms (oxymyoglobin, myoglobin and metmyoglobin) are the main pigments in well-bled muscles responsible for colour. It was found out that the relationship between either L or a parameters and oxymyoglobin is opposite to relationship between L or a and metmyoglobin content in the ducks' muscles comprising total heam pigments and myoglobin on the same level /Woloszyn et al 1997/. The leg and breast portions cut from force fattened ducks are vacuum packed and kept in cooling conditions before sale. There are no data showing the influence of time of storage in cooling conditions on the colour of vacuum packed force fattened ducks' muscles.

**Objectives:**

The objective of the study was to investigate changes in the colour and heam pigments' forms of vacuum packed muscles from force fattened drakes during storage at 1°C. The objective was realized by: sensory assessment of colour intensity, determination of total heam pigments (TP), myoglobin (Mb), oxymyoglobin (MbO<sub>2</sub>), metmyoglobin (MMb) contents, lightness, redness and yellowness.

**Methods:**

The vacuum packed commercial leg and breast portions from force fattened drakes (Mullard) were stored at +1°C for 1, 6, 13 days (breast) and 1, 5, 11 (leg). The portions were packed into PA/PE bags 24 h after the slaughter. The sensory assessment of the colour was conducted by 7 trained testers according to ANALSENS NT programme. 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 lightness(L), redness(a) and yellowness( b) were determined with CHROMAMETER Minalta CR 310. The heam pigments were extracted using the procedure described by Pikul /1993/. The pigment content was determined in the Krzywicki's way/1982/. The experiments were conducted twice. 6 muscles were investigated each time. The Duncan's multiple range test was used for forming homogeneous groups of average values within each kind of muscles.

**Results and discussion.**

The colour of the investigated leg muscle was determined as pink red, whereas the breast muscle colour as light red. The L was higher and a,b were lower in case of the leg muscles than in case of the breast muscles. Among colour parameters only b increased significantly before the 13 day of storage in case of breast muscles. On the other hand in case of leg muscles no significant changes in the colour parameters occurred, though, the slight continuous increase in value of b was observed (table 1). It is most likely that changes occurred as a result of bacteria's growth. The pitch of growth in count of bacteria was observed at the 13 day of the breast muscle storage /Kosek et al.1998/. In spite of changes in the values of b, the sensory assessment of colour did not change during storage of both kinds of muscles. The TP, Mb and MbO<sub>2</sub> content decrease in the breast muscle before the 13 day and in leg before the 11 day of storage at 1°C (table 2). The duration of storage did not effect the MMb content in breast muscles, whereas the MMb content decreased before the 11 day of storage. The decrease in the participation of Mb and MbO<sub>2</sub> (expressed in % of TP) was noticed for both kinds of muscles stored longer than 6 days( breast) and 5 days (leg). The percentage of MMb increased continuously in the breast muscles and in leg ones not before the 5 day of storage. The changes in the pigments can be linked with the growth of bacteria count as well, but the further studies are required to confirm this hypothesis. Bala et al./1977/ stated that *Pseudomonas fragi* had a significant effect on the relative concentration of all the three forms of myoglobin of beef samples stored at +1°C for 20 days. It is hard to explain why the colour of muscles did not change, while the TP concentration was changed. The question requires further studies.

**Conclusions.**

The observed changes in the heam pigment content and its composition in the drakes' muscles did not affect the muscles' colour assessment in the sensory way, a and L parameters. The further studies are required for explanation why the colour of the investigated muscles, L and a parameters were not effected by the changes occurring in the heam pigments.

**Pertinent literature.**

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**Table 1. Drakes' Muscle Colour as Affect of Time of Storage**

Time [days]	BREAST				MUSCLES			
	L		a		b		SE	
	X	SD	X	SD	X	SD	X	SD
1	41.79 <sup>b</sup>	2.35	22.3	2.04	6.77 <sup>b</sup>	1.27	5.42	0.51
6	38.33 <sup>a</sup>	2.83	16.9	3.04	5.41 <sup>b</sup>	0.92	5.15	0.74
13	41.59 <sup>b</sup>	2.36	20.57	3.21	9.93 <sup>a</sup>	1.04	5.43	0.65
18	39.96 <sup>ab</sup>	1.50	22.13	1.24	9.11 <sup>a</sup>	1.06	5.57	0.53

  

Time [days]	LEG MUSCLES			
	X	SD	X	SD
1	44.87	3.24	18.16	1.92
5	43.56	6.57	19.30	1.86
11	43.54	2.92	18.21	1.86

X - average values ; SD - standard deviation; SE - sensory evaluation; a,b - values with differ lettrs , differ at P < 0.05

**Table 2. Heame Pigment Content in Drakes ' Muscles as Affect of Time of Storage [ mg/100g muscles]**

Time [days]	BREAST						MUSCLES					
	TP		Mb		MbO <sub>2</sub>		MMb					
	X	SD	%	X	SD	%	X	SD	%	X	SD	
1	4.63 <sup>a</sup>	0.44	39.3	1.82 <sup>a</sup>	0.21	36.6	1.65 <sup>a</sup>	0.22	21.0	0.97 <sup>a</sup>	0.11	
6	4.78 <sup>a</sup>	0.28	38.9	1.86 <sup>a</sup>	0.19	32.2	1.54 <sup>a</sup>	0.16	23.0	1.10 <sup>a</sup>	0.05	
13	3.04 <sup>b</sup>	0.33	32.9	1.00 <sup>b</sup>	0.15	29.6	0.90 <sup>b</sup>	0.15	33.2	1.05	0.11	
18	2.08 <sup>c</sup>	0.35	25.5	0.53 <sup>c</sup>	0.10	23.1	0.48 <sup>c</sup>	0.09	47.6	0.99 <sup>a</sup>	0.16	

  

Time [days]	LEG MUSCLES					
	X	SD	%	X	SD	%
1	2.96 <sup>a</sup>	0.19	37.2	1.10	0.14	34.8
5	2.83 <sup>a</sup>	0.28	35.7	1.01	0.11	34.3
11	1.48 <sup>b</sup>	0.29	29.1	0.43 <sup>a</sup>	0.08	24.3

X - average value, SD - standard deviation