THE CHARACTERISTIC OF THE BREAST AND THE LEG MUSCLES COLOUR FROM POLISH COMMERCIAL GEESE

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Background

The goose breeding is recognized to be one of the Polish speciality. Geese have been exported mainly to Germany (about 80%). The goose meat quality is determined by many factors. One of them is colour. It has been often the cause for either acceptation or rejection of meat by consumers. The colour of meat depends on such factors as: concentration and chemical state of pigments, and physical structure of meat (Millar et al. 1996, Renerre 1999). Three myoglobin forms: deoxymyoglobin (Mb), oxymyoglobin (MbO_2) and metmyoglobin (MMb) are assumed to be the main pigments that are responsible for colour of well bled muscles. The high quality of food products has to have the invariable sensory profile. In previous investigation, it was observed that the raw goose breast muscles were characterized by different colour and / or different colour intensity (red, red – pink) within the same sex, diet (Skrabka-Błotnicka et al. 1997) and genotype (Rosiński et al. 1999). But, the causes of this occurrence have not been explained. Moreover, there are not adequate data to explain the colour differences in raw goose muscles.

Objectives

The objective of the study was to characterize the colour of the leg and breast muscles from commercial geese. The objective was realized by: sensory assessment of colour intensity, determination of total heam pigments concentration (TP), relative concentration of Mb, MbO_2 and MMb, and lightness (L), redness (a) and yellowness (b).

Methods

The experimental materials covered the leg and the breast portion cut out 24 h after slaughter from the 23 industrially killed geese (White Italian). The heam pigments were extracted using the procedure described by Pikul (1993). The Hewlett Packard's Diode Array UV/VIS spectrophotometer was used for measuring the pigment extract absorbance (wavelength range 350 – 820 nanometers). The concentration of TP and relative concentration of: Mb, MbO_2 and MMb were calculated with the equations given by Krzywicki (1982). The parameters: L, a and b were measured with CHROMAMETER Minolta CR 200b. The sensory assessment of the colour was conducted by the sensory panel (8 persons) according to ANALSENS NT programme, using the ten point scale of intensity. The T-Student's test was used for establishing differences between average values.

Results and discussion

The absorbance spectrum for the extract from breast (fig. 1) and leg (fig. 2) muscles were like the spectrum of light reflected from the surface layer of fresh beef obtained by Krzywicki (1979). Three maximums of absorption are shown at 418, 520 and 580 nm. Therefore these spectra were recognized as typical for fresh meat. The absence of maximum at 630 – typical for MMb – is due to small relative concentration MMb in the fresh muscles. The colour of the investigated leg muscles was defined as red – pink with intensity 6,52 [CU], whereas the breast muscles as red with intensity 7,16 [CU]. The differentiation of colour was not observed within the same kind of muscles, as it was shown earlier (Skrabka-Błotnicka et al. 1997, Rosiński et al. 1999). The differentiation of colour intensity of the individual samples within the same kind of muscle can result from the large differentiation of TP concentration (breast 2,02 – 5,05 mg/g, leg 2,31 – 6,83 mg/g) and / or from differentiation of the relative concentration of: MbO_2 (breast 0,32 – 0,64, leg 0,28 – 0,41); Mb (breast 0,22 – 0,40, leg 0,26 – 0,49); MMb (breast 0,07 – 0,34, leg 0,21 – 0,43). The investigation showed the significantly higher value of MbO_2 relative concentration and lower value of TP concentration, Mb, MMb relative concentration, L and b parameters in breast than in leg muscles of geese (table 1 and 2). It should be added though that in case of some birds the relations were reversed. The finding of the lower value of L parameter for breast muscles than for leg muscles was not expected. Because the breast muscles comprised lower total heam pigments concentration and the fractions of Mb and MMb were lower as well. It cannot explain this occurrence on the ground of the obtained data in this experiment. The many chemical, physical, biochemical and biological factors effect the colour parameters and / or concentration of TP and fractions of: Mb, MbO_2 and MMb that were not investigated in the research.

Conclusions

The colour differences between the breast and leg goose muscles result not only from the TP concentration and relative concentration of Mb, MbO_2 and MMb, but also from other factors that were not investigated. The further studies are required for explanation why the greater part of goose breast muscles are characterized by the lower values of L parameter, than leg muscles.

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Fig 1. The absorbance spectrum for the extract from goose leg muscles

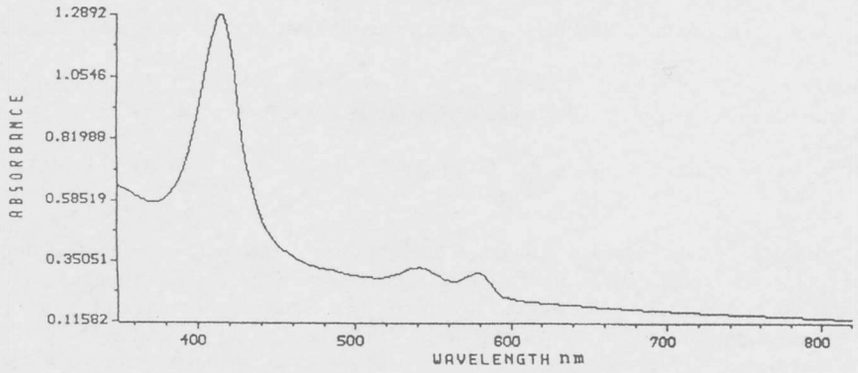

Fig 2. The absorbance spectrum for the extract from goose breast muscles

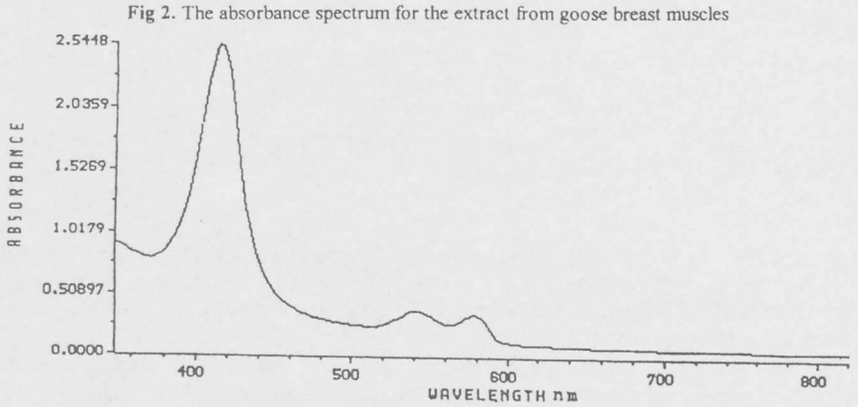

Table1. The pigments' concentration in the breast and the leg muscles from commercial geese

Pigment	Breast			Leg		
	n	x	SD	n	x	SD
Total heam pigments [mg/g]	23	3,58[a]	0,83	22	4,49[b]	1,53
Myoglobin (RC)	23	0,31[a]	0,05	22	0,40[b]	0,06
Oxymyoglobin (RC)	23	0,48[a]	0,08	22	0,32[b]	0,03
Metmyoglobin (RC)	23	0,21[a]	0,08	22	0,28[b]	0,05

n – number of investigated muscles
x – average value
SD – standard deviation
a,b – values with different letters differ at $p < 0,05$
RC – relative concentration

Table2. The colour assessment of the breast and the leg muscles from commercial geese

Parameter	Breast			Leg		
	n	x	SD	n	x	SD
Pink red colour intensity [CU]	--------	--------	----------	22	6,52	0,77
Red colour intensity [CU]	23	7,16	0,95	--------	----------	----------
L	23	36,69[a]	2,75	22	43,21[b]	1,66
a	23	17,96[a]	1,00	22	17,56[a]	1,06
b	23	1,73[a]	0,62	22	2,87[b]	0,87

n – number of investigated muscles
x – average values
SD – standard deviation
a,b – values with different letters differ at $p < 0,05$
CU – conventional unit