THE ASSESSMENT OF VEAL COLOUR FOR CLASSIFICATION PURPOSES

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INTRODUCTION

The acceptance of the EC-system for classification for muscularity and fatness of beef was an important step forward to have a more uniform classification procedure. In The Netherlands the system is also used for veal. However, in this species meat colour is an important quality trait. At present, evaluation of meat colour for classification purposes is done subjectively, using different muscles, a different number of classes, different illumination conditions etc. There is an urgent need in practice to supplement the EC-classification procedure with an objective system for evaluation of veal colour.

Legras (1981) investigated the colour of 33 muscles of veal carcasses varying in meat colour, and recommended for the M.rectus abdominis (RA) for colour, with the aid of a colour standard. In cooperation with the paint industry, we developed a (prototype) colour standard, in an attempt to subjectively evaluate veal colour in a more standarized way. In addition, the Minolta Chromameter and fibre optics such as the Colourmeter Translucent Materials (CTM; Sensoptic) have become available, which allow objective assessment of meat colour on the slaughterline.

The purpose of this study was to evaluate the colour standard and these instruments, as to their predictive value for muscle colour when determined at 24 h post mortem (p.m.) with the Hunter Labscan.

MATERIAL AND METHODS

A total of 100 veal carcasses, al electrically stimulated (LV), were selected by person Y_1 (unexperienced on the slaughterline, by comparing the prototype colour standard (5 ma classes, 15 subclasses) with the colour of the RA (after removal of the fascia). Artificial lighting was used (Philips fluorescent light TL 57). Each main class contained 20 carcasses. Carcasses were also independently judged by 3 other persons, with (Y_2: unexperienced; RA and without (Z_1,Z_2: experienced graders; 8 classes; evaluation of the entire carcass) the use of the colour standard. Both scatter and adsorbtion were measured on the surface of the right RA with the CTM (Sensoptic, Westeremden, The Netherlands) probe (apparatus I). For practical reasons the right RA was removed at 35 min p.m. and directly measured with the CTM (app. II, similar as I, but adsorbtion only) and the Minolta Chromameter II (50 mm sample port; L*,a* and b* (CIELAB) values;CIE 19 standard observer). Both measurements can be performed, however, on the slaughterline.

The right RA was subsequently wrapped in polyethene and stored at 2-4 °C. The left RA was left in situ. All carcasses were subjected to fast chilling for almost 1.5 h, before they were moved to the equalization room. At 24 h p.m. the left RA was removed from the carcass and the colour (CIELAB values) of both left and right RA was determined using the Hunter Labscan 5000 (30 mm sample port, D65 lightsource, CIE 1964 standard observer).

Spearman correlations were compute between and among measurements made early and at 24 h p.m. With discriminant analysis it was investigated how well the classification of the experienced graders could be predicted from the other measurements made early p.m.. Finally a multiple regression analysis was carried out, with Hunter L* values as the dependent variables

RESULTS AND DISCUSSION

In table 1 the results of the Spearman correlations between the early p.m. measurements and Hunter values are presented. Since much lower correlations were obtained for Hunter b* values, only Hunter L* and a values are presented. In general, correlations are higher for Hunter L* than for Hunter a* values. The Minolta a* and b* values appeared unsuitable as single predictors of veal colour. The other measurements showed a good relationship with Hunter L* at 24 h p.m. However, the variation in the experimental material was very large, which can easily lead to high correlations. The Spearman correlation coefficients between the 4 visual evaluations varied from .81 to .93. The latter correlation was between Y_1 and Y_2.

The discriminant analysis revealed that with the colour standard Y_1,Y_2; 15 classes) 43 and 49 % of the classification by Z_1 and Z_2 could be correctly predicted, respectively. With all objective measurements these percentages increased to 52 and 61 % and with the combination of objective measurements and visual evaluations with the colour standard to 63 and 66 %, respectively.

The results of the multiple regression analysis with Hunter L* values as the dependent variable, are presented in Table 2. Y_1 accounted for 75 and 80 % of the variations in L* of the right and left RA respectively, whereas the combination of Minolta values were 80 and 81 %, the CTM equipment (adsorbtion, app. I,II) 78 and 74 % and Z_1,Z_2 72 and 80 % of the variations in L* value of the right and left RA, respectively.

The results suggest in general that better results are obtained by an unexperienced person with the use of the prototype colour standard, than by an experienced grader. However, it should be pointed out that carcasses were also selected with the colour standard, which may have influenced the results.

At present the colour standard is subject to metamerism, because the pigments are different from those in the meat. Therefore, a light source need to be selected that minimizes the colour difference between the standard and the meat. It is also important that gloss is avoided by selecting appropriate illumination and viewing angles. Furthermore, no traction should be imposed upon the muscle during the judgement, since this will give a lighter impression of the muscle colour.

Apart from inhomogeneity of the biological material, differences in the geometry of the various instruments may have influenced the results(Sterrenburg, 1989).Yet, acceptable results as to the prediction of muscle colour were achieved when the Minolta values were combined. In principle, it should be possible to compute in line a veal colour classification class from the CIELAB values.The results with the CTM were less satisfactory. Since this study was conducted, however, an improved version of the probe, mounted in an apparatus for automatic invasive measurements, has become available. Further research is necessary to develop a veal colour classification system based on objective measurements. Before such a system is available, the use of a colour standard could serve as an appropriate alternative. Although the prototype can still be further improved, it can contribute to an acceptable and more uniform classification of veal colour in practice.

REFERENCES

Legras,P.(1981). La couleur de la viande mesures objectives ou jugement visuel. VPC, 2, 17-23.

Sterrenburg, P.(1989). Influence of sample illumination and viewing on the colour measurement of translucent material like meat. 38th ICoMST, 1989, Copenhagen.

Table 1. SPEARMAN CORRELATIONS BETWEEN EARLY POST MORTEM MEASUREMENTS AND MEAT COLOUR OF M. RECTUS ABDOMINIS (RA) AT 24 H P.M.

		Right RA		Left RA	
		L^*	a^*	L^*	a^*
Colour standard	Y_1	-.87	.79	-.89	.80
	Y_2	-.84	.83	-.86	.76
Exp. grader	Z_1	-.81	.76	-.88	.74
	Z_2	-.81	.74	-.87	.74
Minolta	L^*	.85	-.80	.85	-.73
	a^*	-.51	.47	-.49	.54
	b^*	.58	-.50	.59	-.37
CTM (app. I) scatter		-.58	.47	-.50	.46
adsorbtion		-.85	.75	-.83	.66
(app. II) ,,		-.89	.77	-.87	.78

N= 100

Table 2. PREDICTION OF MUSCLE LIGHTNESS (HUNTER L^*) AT 24 H P.M. BY EARLY POST MORTEM MEASUREMENTS.

		HUNTER L^*			
		Right RA		Left RA	
		R^2	S.E	R^2	S.E.
Colour standard	Y_1	.75	1.9	.80	1.8
	Y_1,Y_2	-	-	.82	1.8
Exper. grader	Z_1	.69	2.1	.75	2.0
	Z_1,Z_2	.72	2.0	.80	1.8
Minolta	L^*	.72	2.0	.72	2.2
	L^*,b^*	.77	1.8	.78	1.9
	L^*,b^*,a^*	.80	1.7	.81	1.8
CTM adsorbtion	(app.II)	.74	2.0	-	-
	(app.I)	-	-	.67	2.4
	(app.I,II)	.78	1.8	.74	2.1

N= 100