Reproducibility of colour score as a result of classification of veal in the Netherlands

P. STERRENBURG[1], H. NIJEBOER[1] and Tj. DE BOER[2]

[1] Research Institute for Animal Production "Schoonoord", P.O.Box 501, 3700 AM, Zeist, The Netherlands

[2] Commodity Board for Livestock and Meat, P.O.Box 5805, 2280 HV, Rijswijk, The Netherlands

SUMMARY

Colour classification of veal in the Netherlands is carried out 45 min. p.m. by an independent organisation, the "Centraal Bureau voor Slachtveediensten" (CBS). The classification is performed visually using standardized conditions. Veal carcasses are classified into five colour classes by comparison of the *m. rectus abdominis* with a colour standard. The performance of the CBS grading personel is regularly checked with parallel-classification by inspectors. The correlationcoefficient between the results of the parallel-classification can be considered as a measure of reproducibility of the colour evaluation system.

Parallel-classifications were carried out at 7 slaughterhouses and involved a total of 6628 veal carcasses. Of these carcasses 79.8% were assigned the same colour class by both the CBS-personel and the inspectors. The inspectors assigned 10.5% of the carcasses one colour class lower and 9.7% of the carcasses one class higher than the CBS personel. The correlationcoefficient between the results of the parallel-classification was 0.87.

Although the system of colour classification is visual, the results indicate that, with a uniform implementation of the system, a high degree of comparability and reproducibility can be achieved.

INTRODUCTION

According to DE BOER (1984) classification is description of carcasses in unambiguous terms without attaching economical value to the classes. This implicates that classification must be performed independent of parties involved in carcass trading. In the Netherlands classification is performed by an independent organisation; the "Centraal Bureau voor Slachtveediensten" (CBS). To assure uniformity and independency of the classification the CBS personel is periodically rotated over the slaughterhouses. Moreover the performance of CBS personel is regularly checked by inspectors, appointed by the commission quality control classification in which both government and industry are represented.

In veal, as in beef, the carcasses are classified according to conformation and fatness. In veal a third important carcass characteristic is colour. Colour can be assessed both instrumentally and visually. A disadvantage of instrumental colour assessment of meat is that the measurement is subject to errors caused by edge-loss (STERRENBURG, 1989). Visual colour description by matching in standardized conditions with defined objects is a internationally accepted method (BILLMEYER AND SALTZMAN, 1981).

CBS personel classify veal carcasses at 30-45 min p.m. into five colourclasses by matching in standardized conditions the colour of the *m. rectus abdominis* with a colour standard, developed by the Research Institute for Animal Production (STERRENBURG, 1990). Although the colour classification is standardized, differences in colour score can arise from the fact that classification is carried out by different persons.

The aim of this study is to determine the reproducibility of the colour classification system.

MATERIALS and METHODS

Classification is carried out with lighting of Philips fluorescent tubes TL57, with a minimum lighting intensity of 800 lux at the object. Matching is performed with the exclusion of gloss.

The veal colour standard used at classification consists of five opaque colour chips. The CIELAB values of the chips, as assessed with a spectrofotometer (Hunter Labscan 5000) using a D65 and a CIE (Commission Internationale d'Eclairage) 1964 (10°) Standard Observer, are stated in Table 1.

Table 1 CIELAB values of the colours of the veal colour standard.

Colour code	1	2	3	4	5
L*	60,7	54,8	48,7	42,2	36,6
a*	6,9	9,2	9,5	11,6	11,4
b*	14,3	13,3	11,8	10,2	9,4

The chip with colour code 1 is the most pale, with colour code 5 the darkest colour of the standard.

Reproducibility is calculated as the correlation coefficient between the results of parallel-classification. Besides reproducibility the similarity in colour score assigned by the CBS personel and the inspectors is calculated.

Independent parallel-classifications were carried out in 118 visits to 7 slaughterhouses by four inspectors and involved a total of 6628 veal carcasses.

RESULTS and DISCUSSION

The distribution of the classification on colour by both the CBS personel and the inspectors of veal carcasses is described in Table 2.

Table 2 Distribution of colour score in veal carcasses by CBS personel (Row) and inspectors (Column).

Colour class	1	2	3	4	5	Total
1	217	72				289 4.4%
2	77	1279	319			1675 25.3%
3		256	2495	228		2979 44.9%
4			249	1027	76	1352 20.4%
5				63	270	333 5.0%
Total	294 4.4%	1607 24.2%	3063 46.2%	1318 19.9%	346 5.2%	6628 100 %

The reproducibility of the colour classification of the 118 inspections ranged from 0.55 to 0.96. The overall reproducibility was 0.87. The inspectors assigned 79.8 % of the carcasses the same colour class, 10.5 % one class lower and 9.7 % one class higher than the CBS personel did.

The distrubution over the colour classes for both row and column are practically identical. Moreover the dissimilarities in colour score are evenly distributed over the colour classes.

The parallel-classifications are carried out by four different inspectors. The results of the different inspectors are summarized in Table 3.

Table 3 Results of parallel-classification pro inspector.

Inspector	Reproducibility (r)	Similar score (%)	One class lower (%)	One class higher (%)	Number of animals
A	0.84	76.5	6.0	17.5	400
B	0.83	80.0	10.3	9.7	525
C	0.84	72.0	18.7	9.3	750
D	0.88	81.2	9.6	9.2	4953

Most of the parallel-classifications are carried out by inspector D, who's results also corresponds best with the results of the CBS personel. However, the results of the other 3 inspectors are fairly similar.

Besides differences originating from various inspectors, differences can originate from the conditions in the various slaughterhouses. In Table 4 the results of the parallel-classifications in the different slaughterhouses are stated.

Table 4 Results of parallel-classification pro slaughterhouse.

Slaughterhouse	Reproducibility (r)	Similar score (%)	One class lower (%)	One class higher (%)	Number of animals
I	0.87	81.3	8.0	10.7	150
II	0.87	82.5	10.5	7.0	655
III	0.88	83.2	9.3	7.5	600
IV	0.86	77.3	13.0	9.7	1200
V	0.89	81.6	10.5	7.9	1180
VI	0.88	80.0	7.2	12.8	1393
VII	0.84	77.4	12.3	10.3	1450

According to Table 4 differences between slaughterhouses are minor. This indicates that the conditions at the slaughterhouses are adequately uniform for application of standardized visual colour classification.

CONCLUSIONS

With a uniform implementation of a visual colour classification system a high degree of comparability and reproducibility can be achieved.

REFERENCES

De Boer, H. 1984. Classification and grading; principles, definitions and implications. In: Carcass evaluation in beef and porc: opportunities and constraints. Proc. Sat. Symp. EAAP. Research Institute for Animal Prod. Zeist. p 9-20

Billmeyer, F.W. and M. Saltzman. 1981. Principles of color technology. 2nd Edition. John Wiley and Sons. New York.

Sterrenburg, P. 1989. Influence of sample illumination and viewing on the colour measurement of translucent materials like meat. Proc. 35th Int. Congress of Meat Sci. and Techn. Copenhagen. Vol. 2. p 610-613

Sterrenburg, P. 1990. Development of a colour standard for veal. IVO-Rapport B-363. Zeist. (Dutch, Eng. summary) 49 p.