1COMPARISON OF THE MINOLTA GRADING METER AND THE SCM DATALOGGER TO MEASURE COLOR AND PIGMENT CONTENT OF VEAL MEAT

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SUMMARY

In Canada veal carcasses are graded instrumentally and certain problems have arisen from this procedure. Industry would like to grade much earlier post-mortem then the prescribed 48-hour delay in the grading regulations in order to reduce storage time and increase throughput. Additionnaly there are problems associated with the site of measurement. The pectoralis muscle used to grade the carcasses does not detect DFD carcasses particularly when the problem is restricted to the loin area. Results from this work have shown that an invasive measurement in the loin may permit grading at 24 hours and reflect more accuratly the economic value of the carcass.

Introduction

In Canada veal is graded for color on the brisket with a Minolta grading meter (Brach et al. 1987). In veal carcasses one often encounters dark cutting meat resulting from preslaugther stress associated with transport or preslaughter lairage and this condition has a tendency to develop more specifically in the hind part of the carcass in the longissimus dorsi (LD) at the sirloin level. Hence, dark-cutting carcasses may not be identified by the grading system which measures color on the pectoralis profundus (PP) muscle.
The objectives of this work were to evaluate the SCM datalogger, an instrument extensively studied in the Netherlands (Eikelenboom et al., 1992) and compare it with the current grading instrument. Additionnaly the trials adressed the capacity of the instruments to quantify pigment content and evaluate different sites of measurement in order to describe more accurratly the economic value of the carcass.

MATERIALS AND METHODS

Trial 1

Two hundred and twenty veal calves (120 milk-fed and 100 grain-fed) were chosen at the slaughter plant. The color was measured at 45 min, 24 hours and 48 hours post-mortem on the exposed PP muscle on the brisket, on the inside of the flank, on the rectus abdominus (RA) muscle and on the inside of the carcass on the ventral part of the loin just caudal to the kidney on a triangular area showing underlying muscle. The measurements taken on the RA and on the ventral part of the loin were taken through the connective tissue membrane to simulate normal grading which would not allow the removal of this membrane. Measurements on the LD muscle were made between the 11th and 12th rib in the case of milk-fed veal and between the 5th and 6th rib in the case of grain-fed veal. Invasive measurements were taken by using the probe furnished with the SCM Data Logger and inserting it between the 11th and 12th rib in the middle of the LD muscle. A slice of pectoralis muscle about 5 mm thick was used to determine myoglobin content.

Trial 2

One hundred grain-fed veal carcasses were chosen as described in trial 1 and color measurements were taken at 24 hours and 48 hours post-mortem on the brisket on the PP muscle and the carcasses were cut between the 11th and 12th rib and color was measured on the LD muscle at 48 hours. Invasive measurements were taken by using the probe furnished with the SCM Data Logger and inserting it between the 11th and 12th rib in the middle of the LD muscle. Meat pH was determined at 48 hours in the the PP muscle at the grading site and in

the LD muscle at the point of insertion of the SCM Data Logger probe using a portable pH meter equipped with a polycarbonate pointed electrode.

Statistical analysis

Pearson correlation coefficients and simple linear regression analysis were performed using the SAS statistical analysis procedures.

RESULTS AND DISCUSSION

Trial 1

Predictive performance

Preliminary analysis of the regression data led us to decide to analyse the results separately due to the obvious differences in intercepts of any regression equation predicting color of grain-fed or milk-fed veal. The analysis also showed that using 45-min readings to predict 48-hour measurements would not be feasible hence we present here the results of the regression analysis for the predictive performance of the 24 hour measurements only (table 1).

Results showed that the 24-hour measurements using the Minolta would be too low for practical predictive purposes in a commercial setting. The R^2 would be better for milk-fed veal carcasses and this would reflect the bigger range of color values in the milk-fed group. The regression results using the SCM Data Logger were better and certain measuring sites seemed more promising than others. The interior measurement in the loin using the probe at 24 hours to predict the color of the same site at 48 hours seemed the best combination.

Correlation coefficients

Generally speaking the correlation coefficients were higher between variables from milk-fed veal calves compared to the grain-fed calves (table 2). This observation could partly be explained by the wider range in color values obtained in the milk-fed veal population. The relationship between instruments for measurements taken at the the same time points on the same location was quite good as judged by the high r values. This would indicate that the instruments were measuring similar characteristics even if fundamentally the measuring systems were quite different. The correlation coefficients obtained between color measurements at 45 min postmortem and the myoglobin content of the PP muscle did not however show much difference in the capacity of the instruments to measure pigment content. It must be emphasized that the relationship between pigment and color readings were not necessarily linear and this would affect the r values. This aspect will be adressed elsewhere.

Trial 2

This trial was done to determine the feasibility of detecting dark cutting carcasses. The ultimate test to confirm if a piece of meat was DFD was to measure the ultimate pH. We classified the carcasses with respect to the ultimate pH and grouped them into 3 classes (Table 3). As can be seen the pH of the loin was not necessarily in agreement with that of the brisket, furthermore the color measured on the loin which in general was paler than that found on the brisket, was, in the case of DFD carcasses, darker than the color found on the brisket. This observation was true with the Minolta and the SCM Datalogger. We created a borderline group consisting of loin ultimate pH values between 5.8 and 6.0 and we did not observe the same trend as with the carcasses having loin ultimate pH lower than 6.0. An invasive measurement would detect a color defect and would indicate if a carcass is DFD particularly if the color value could be compared to that of the brisket. On the other hand, a pH measurement in the loin would be a positive identification for DFD carcasses and would permit the distinction between normally dark loins due to feeding regimens independent of preslaughter stress.

CONCLUSIONS

The measurement taken in the loin could probably permit grading at 24 hours instead of 48 hours. This would favor the use of the SCM Datalogger since it has an invasive probe.

Both instruments seemed equivalent in accuracy to predict pigment.

The correlation coefficients between the invasive measurement with the probe and the surface measurement at the same location indicated that what was measured with the probe was sure enough what would be seen by a surface measurement with the same instrument.

The detection of DFD loins could not be made on the basis of a color measurement on the brisket but a color measurement on the loin with the SCM Datalogger was not necessarily a garantee of a case of DFD muscle. A carcass could have been darker because of feeding management procedures. Additionnaly there was evidence (results not shown) that with milk-fed carcasses, although the meat was darker when it was DFD , the color encountered could cause interpretation problems which could only be resolved by measuring ultimate pH.

References

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