YIELD GRADE RULER APPROACH FOR GRADING OF VEAL CARCASSES

Marcel Marcoux[1], Catherine Thibault[1], Nuria Prieto[2], Sophie Zawadski[2], Haley Scott[2] and Óscar López-Campos[2*]

[1]Sherbrooke Research and Development Centre, Agriculture and Agri-Food Canada, QC, Canada

[2] Lacombe Research and Development Centre, Agriculture and Agri-Food Canada, AB, Canada

*Corresponding author email: oscar.lopezcampos@agr.gc.ca

I. INTRODUCTION

Canadian grain-fed veal is considered a specialized production with over 129,000 head marketed in 2020. The Canadian veal grading system categorizes carcasses based on their conformation, finish status, meat and fat colour, under the Livestock and Poultry Carcass Grading Regulations [1]. Veal carcasses in Canada are not segregated in terms of yield performance. Carcass yield estimations are important to evaluate growth and select animals for production traits. Total lean meat and saleable yields are the main criteria used to determine carcass value, and hence, yield estimations are incorporated in most traditional grading schemes [2]. Objective yield assessments provide an opportunity for the veal industry to improve genetic selection based on body composition. The Canadian veal industry is now in the process of implementing yield assessments for veal carcass grading purposes. The ability to predict veal carcass performance using anatomical linear measurements is still unknown. The objective of the present study was to evaluate a yield grade ruler approach to predict performance of veal carcasses for grading purposes.

II. MATERIALS AND METHODS

A total of ~300 (males and females) left carcass sides representative of the current Canadian veal population (weight: 127.5-189.2 kg; backfat: 0.5-20.7 mm) were used in the present study. Left carcass sides were weighed to determine cooler shrink loss. Rib-eyes were ribbed above the 13th as well as between 12th-13th and 11th-12th ribs. After a 20 min exposure to atmospheric oxygen, detailed Canadian grade data was assessed at the different rib-eye locations by a Canadian Beef Grading Agency certified grader. The assessments included muscle width (mm of maximum width within the 2nd and 3rd quarter and perpendicular to the longitudinal axis of the rib-eye muscle) and length (mm of maximum length of the rib-eye), fat thickness (fat thickness over the rib at ¼, ½ and ¾ position from the spinous process) and rib-eye area (REA: in cm^2 of the *longissimus dorsi*). Following, carcass sides were scanned with a Lunar iDXA unit to evaluate the total lean, fat, and bone content. Statistical analyses were performed using SAS 9.4, PROC GLM, PROC CORR and PROC REG procedures. Prediction accuracies were evaluated using the coefficient of determination (R^2).

III. RESULTS AND DISCUSSION

Overall, in the present study total lean of the left carcass sides ranged between 48.8 and 68.1% whereas fat values were within 10.8 and 30.8% (Table 1). Male carcasses were significantly ($P<0.0001$) leaner (16.3%) than female ones (23.5%). Total carcass lean was mainly correlated with the hot carcass weight ($r=0.65$), ¼ backfat thickness ($r=-0.34$) and REA ($r=0.58$). These results concur with previous studies in different species reporting yield estimations performed using anatomical linear measurements that segregate carcasses into grades or classes [3]. The time to grade veal carcasses at the grading stand is limited and the efficiency of the grading tools (e.g., ruler) has to be maximized. The main factors considered to develop a prediction equation were the ¼ backfat thickness and REA. Out of the three rib-eye locations evaluated, the 11th-12th showed the highest accuracies (Table 2) to predict lean meat yield percentage using the backfat thickness and the REA (R^2= 0.66) whereas R^2 values were slightly lower when the regression model was developed using the measurements from all rib-eye locations (R^2=0.60). These continuous variables (backfat thickness / REA) were categorised assigning fat classes (1-10) in 2mm increments and 4 muscle scores (small-large REA), in order to maximize predictions effectiveness. The equation developed for the estimation of lean yield, incorporating the anatomical traits categorized Fat Class and Muscle Score, showed an R^2 of 0.62 and a root mean square error of 2.14%. Based on this equation, a matrix of estimated lean meat yield percentage using the fat class and muscle score descriptors (Table 3) was developed for the implementation in a veal yield grade ruler.

Table 1 Descriptive results of the lean and fat composition of left carcass sides used in the present study.

	Overall (n=298)			Male (n=149)			Female (n=149)		
Carcass composition (%)	Mean±SD[1]	Min	Max	Mean±SD	Min	Max	Mean±SD	Min	Max
Lean percentage	57.5±3.4	48.8	68.1	60.1±2.1	53.6	68.1	54.9±2.5	48.8	62.3
Fat percentage	19.9±4.5	10.8	30.8	16.3±2.6	10.8	25.0	23.5±3.0	14.8	30.8

[1]SD: standard deviation

Table 2 Relationship (R^2) between lean meat yield percentage and the combination ¼ backfat thickness and ribeye area (REA) across the different rib locations.

Rib location	n	¼ and REA
Above 13th	298	0.54
12th – 13th	298	0.61
11th – 12th	298	0.66
All locations	894	0.60

Table 3 Estimated lean meat yield percentage matrix based fat class and muscle score

	Fat Class									
Muscle Score	1	2	3	4	5	6	7	8	9	10
1	58.7	57.5	56.3	55.2	54.0	52.8	51.6	50.4	49.2	48.0
2	59.9	58.7	57.5	56.3	55.1	53.9	52.7	51.5	50.4	49.2
3	61.0	59.8	58.6	57.4	56.3	55.1	53.9	52.7	51.5	50.3
4	62.2	61.0	59.8	58.6	57.4	56.2	55.0	53.8	52.6	51.4

IV. CONCLUSION

Preliminary results of the present study suggest that lean yield percentage of veal carcasses can be objectively and accurately predicted by applying a yield ruler approach. This tool might facilitate the veal yield grading by just determining the fat class (at ¼ backfat thickness) and muscle score at the 11th–12th rib location.

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