DOES THE CARCASS GRADING SITE AFFECT MARBLING SCORE AND PREDICTIONS OF EATING QUALITY IN LATE-MATURING BEEF CATTLE?

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I. INTRODUCTION

The European beef industry lacks mechanisms for delivering feedback from the consumer to the producer in terms of palatability [1]. The Meat Standards Australia (MSA) grading scheme offers a solution to better assess the quality of beef meat using quality scores of several cuts (MQ4 scores) and of the whole carcass (MSA index) including interactions with cooking methods and aging time. These scores are predicted with a robust model fed with pre- and post-slaughter information and carcass characteristics [1]. For instance, intramuscular fat (marbling) is one of the most important used meat features related to consumer's sensory expectations [2]. The MSA model was developed in Australia, where animals are mainly of early-maturing breeds and carcasses are generally graded on cut surface of *longissimus thoracis and lumborum* muscle from the 10th to 12th *thoracic vertebrae*. In Europe, meat from young late-maturing breeds is largely consumed. For commercial reasons, carcasses of young cattle are cut mainly at the 5th *thoracic vertebrae*. This study aimed to investigate the impact of the grading site (5th *vs* 10th) and the carcass side (left *vs* right) on i) predicted MQ4 scores of 5 cuts, ii) predicted MSA index, and iii) intramuscular fat measured visually using 2 marbling scoring systems in late-maturing cattle.

II. MATERIALS AND METHODS

Information on 55 young bulls and heifers were collected using the MSA guidelines by a trained MSA chiller assessor. To assess marbling, two scores measured by visual assessment of *longissimus thoracis and lumborum* muscle were used: the AUS-MEAT marbling and the MSA marbling. The first describes the amount of intramuscular fat on a scale from 0 to 9 with 1-point increments and the second describes the amount, size, fineness, and distribution of intramuscular fat inclusion in the muscle on a scale from 100 to 1,190 with 10-point increments. All the MSA variables collected in the slaughterhouse were used to predict the MQ4 scores for 5 cuts as well as the MSA index using the MSA model. The predicted MQ4 scores were calculated according to the most common cooking method for each cut assuming that all the carcasses were Achilles hung and aged for 10 days. The MSA index was predicted after an ageing time of 5 days and resulted from the weighed sum of the predicted MQ4 scores of all cuts. A mixed linear model was used to investigate if the grading site and the carcass side affect marbling scores as well as the predicted MQ4 scores and MSA index. A stepwise multiple regression analysis was performed for predicted MQ4 scores and MSA index to determine how the explained variance changes by gradually adding MSA measured traits to the model.

III. RESULTS AND DISCUSSION

The predicted values of MQ4 for the studied cuts averaged 61.02 indicating that the young bulls and heifers produced meat of 'good every day' quality (MSA guidelines). The coefficient of variation was

low for all the MQ4 scores and MSA index (on average 4.01%) suggesting a certain homogeneity of the slaughtered animals. The MSA marbling and AUS-MEAT marbling scores, the MSA index and MQ4 scores were higher at the 5th grading site (P<0.01), whereas they did not vary significantly according to carcass side (Table 1). The MSA marbling score explained most of the variability of each single trait measured at both the 5th and 10th site. The overall results pointed out the different intramuscular fat deposition between the anterior and posterior of animal's body; intramuscular fat started to deposit from the anterior to the posterior part, and this is probably exacerbated in late-maturing breeds.

Table 1. Least squares means and standard error of the mean (SEM) of MSA traits and predicted MQ4 scores and MSA index for the side and site effects

Trait	Carcass side		SEM	P-value	Grading site		SEM	P-value
	Left	Right			5th rib	10th rib		
Meat Standards Australia								
AUS-MEAT marbling score	2.11	2.02	0.18	0.14	2.32	1.81	0.18	<0.01
MSA marbling score	457	452	17.0	0.21	480	429	17.0	<0.01
Predicted MQ4 scores[1]								
M. longissimus thoracis grilled	67.6	67.6	0.44	0.80	68.2	66.9	0.44	<0.01
Anterior striploin piece grilled	62.1	62.1	0.54	0.82	62.8	61.3	0.54	<0.01
M. gluteus medius grilled	54.2	54.2	0.32	0.66	54.4	54.0	0.32	<0.01
M. gluteus medius roasted	62.8	62.8	0.33	0.42	63.0	62.6	0.33	<0.01
M. obliquus internus abdominis stir fry	72.2	72.2	0.47	0.67	72.8	71.6	0.47	<0.01
MSA index[1]	61.0	61.0	0.33	0.94	61.4	60.6	0.33	<0.01

[1]MQ4 scores and MSA index lay on a scale from 0 (lowest quality) to 100 (highest quality).

IV. CONCLUSION

The present study highlighted that the grading site (5th or 10th rib) has an impact on measured MSA marbling score in late-maturing young bulls and heifers, likely related to the fat deposition and the age of the animals at slaughter. Moreover, the grading site affects the prediction of MQ4 scores and MSA index, and this can lead to bias in the MSA model outputs on European animals quartered at the 5th rib. From a practical point of view an adjustment for the MSA model could allow better prediction of late-maturing beef cattle avoiding over- or under-estimation of animal's potential.

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