MARBLING SCORE VERSUS INTRAMUSCULAR FAT % AS PREDICTORS OF BEEF EATING QUALITY

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I. INTRODUCTION

Marbling is the visual representation of intramuscular fat and has a significant positive effect on eating quality of beef [1]. Currently, under Meat Standards Australia beef grading systems (MSA), marbling is assessed visually at the rib eye. However, with the development of new technologies trained on chemical intramuscular fat percentage (IMF%), there is a need to understand which trait best describes consumer eating quality. It is possible that IMF% may be a more accurate predictor of eating quality than visual marbling score, as the later relies upon a human grader to subjectively score marbling particles at a single site [2]. Therefore, while it is expected that both visual marbling score and IMF% will be positively associated with consumer eating quality, it is hypothesised that IMF% will account for more of the variability in eating quality.

II. MATERIALS AND METHODS

Composite eating quality scores (CMQ4) from grilled beef striploin (M. *longissimus lumborum*), aged 14-15 days (n = 2985) were used from the MSA eating quality database [3,4]. All striploins had complete datasets for MSA carcass grading data and IMF% values. For determination of IMF%, 100g from the striploin was removed and trimmed of all external fat and epimysium and diced before being frozen at -20°C. Samples were then freeze dried and then finely ground. Chemical IMF% was measured by a soxhlet calibrated near infrared (NIR) spectroscopy procedure [5]. Striploin MQ4 data were analysed using general linear models in SAS (SAS Version 9.1, SAS Institute Cary, NC, USA). The base striploin MQ4 model included sex, hot carcass weight, hormone growth promotant status, hump height, subcutaneous rib fat depth, ossification score, ultimate pH and feed type. MSA marble score and Chemical IMF% were then added simultaneously into the base model. Finally, MQ4 was analysed with both MSA marble score and chemical IMF% in the base model.

III. RESULTS AND DISCUSSION

Supporting the hypothesis, both marbling and IMF% were positively associated with striploin MQ4 scores ($P<0.05$). Increasing MSA marble score from 100 to 600 was associated with an increase in MQ4 by 25 units from 40.4 to 65.7 ($R^2 = 0.269$, RMSE = 11.898). Similarly, increasing IMF from 1 – 12%, was associated with an increase ($P<0.05$) in MQ4 of 32 units from 41.1 to 73.5 units and also described more variation in MQ4 ($R^2 = 0.302$, RMSE = 11.737). This result indicates that IMF% may be more accurate in describing the quantity of marbling [2], in particular, it would potentially account for IMF, that may be excluded as intermuscular fat (seam fat) on visual assessment of marbling in the rib eye. However, the inclusion of both MSA marble score and IMF% in the base model further improved MQ4 prediction ($R^2 = 0.34$, RMSE = 11.63), with both terms significant ($P<0.05$). While the mechanism that underpins this effect is unclear, it indicates that both IMF% and MSA marble are describing independent variation in MQ4 not captured by their individual terms.

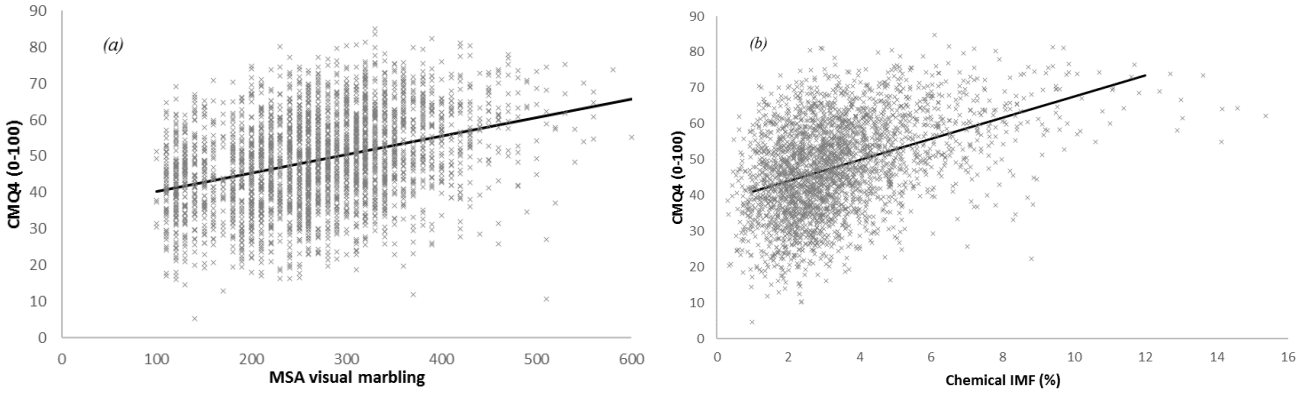

Figure 1. Association between Striploin (M. longissimus lumborum) composite meat quality scores (MQ4) and (a) Meat Standards Australia (MSA) visual marbling score and (b) chemical intramuscular fat %. Solid line represents predicted least squared means and icons (x) represent residuals from response surface.

IV. CONCLUSION

The use of MSA marbling and IMF% resulted in a modest improvement in the prediction of grilled striploin consumer eating quality. Further analysis is required to understand if a similar effect occurs in other cuts, aging periods and cooking methods.

ACKNOWLEDGEMENTS

Meat and Livestock Australia and Meat Standards Australia are thanked for the contribution of data made available for this analysis. This work was funded by the Rural Research and Development (R&D) for Profit program.

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