SAMPLE SIZE FOR DETERMINATION OF CHEMICAL INTRAMUSCULAR FAT IN BEEF

Sarah M. Stewart[1*], Graham E. Gardner[2] and Garth. Tarr[3]

[1] Advanced Livestock Measurement Technologies (ALMTech), Murdoch University, Western Australia 6150, Australia

[2]School of Mathematics and Statistics, University of Sydney, New South Wales 2006, Australia

*Corresponding author email: S.Stewart@murdoch.edu.au

I. INTRODUCTION

Emerging technologies are being developed which will allow for the objective measurement of intramuscular fat (IMF) in Australian beef. These technologies require a uniform gold-standard for IMF, enabling them to train upon and become accredited to predict this trait. Several studies have demonstrated that the distribution of fat varies within the M. *Longissimus* of beef carcasses [1, 2, 3]. Therefore, sub-sampling for IMF% may therefore inadvertently introduce error when quantifying IMF% at a cut level. Recent work has demonstrated that 80% of the marbling within the anterior M. *Longissimus thoracis lumborum* (striploin) is present as a single interconnected entity rather than as isolated flecks [4] and independent of marbling level. This would indicate that marbling distribution is relatively consistent within the anterior striploin [3]. Therefore, it was hypothesised that cumulative cross-sectional sampling of the anterior striploin would minimise sampling error to a negligible amount when quantifying the IMF% in beef striploins.

II. MATERIALS AND METHODS

A total of 60 M. *Longissimus thoracis lumborum* (striploin) were collected from carcasses (19 cows, 41 yearlings) processed at a commercial abattoir. Carcasses were graded for MSA marbling at the 11/12th rib (320 ± 125.5, 140 – 650). and yearlings were graded at the 12th/13th rib (380 ± 156.3, 140 - 670). Striploins were dissected from the carcass and vacuum packed and stored overnight at 1°C until the next day. Striploins were trimmed of all subcutaneous fat, connective tissue (epimysium) and M. *Gluteus medius*. Fifteen slices were dissected from the anterior (graded) end (10 x 5mm; slice 5 x 10mm) and 10 slices (10 x 10mm) were dissected from the posterior end of the striploin. Slices were diced, placed into pre-weighed tubes and weighed prior to freezing at -20°C. Samples were then freeze-dried and weighed to determine dry matter percentage (%). Dried samples were ground and IMF% content was determined using chloroform soxhlet calibrated lab based Near Infra-red (NIR) analysis and reported on a wet matter basis. Cumulative slice IMF% was calculated by averaging the IMF% of each progressive slice. Sampling error was analysed as the absolute difference between cumulative slice IMF% and IMF% of the striploin (average of all slices). Data was analysed using the tidyverse and ggplot packages in R [5].

III. RESULTS AND DISCUSSION

In line with the hypothesis, sampling error declined rapidly with increasing sample size and at 15mm depth, maximum error for most samples was less than 0.45% IMF% (Figure 1). From an industry perspective this means that a sample size of approximately 15mm from the grading site is sufficient to minimise sampling error and quantify total IMF% in striploins. Where larger cumulative errors were observed (Figure 1), they may have been caused by heterogeneity or distribution of fat seams [4] within samples. Further work to understand if alternative sampling sizes for IMF% are required for high marbling phenotypes (> MSA marbling score 700).

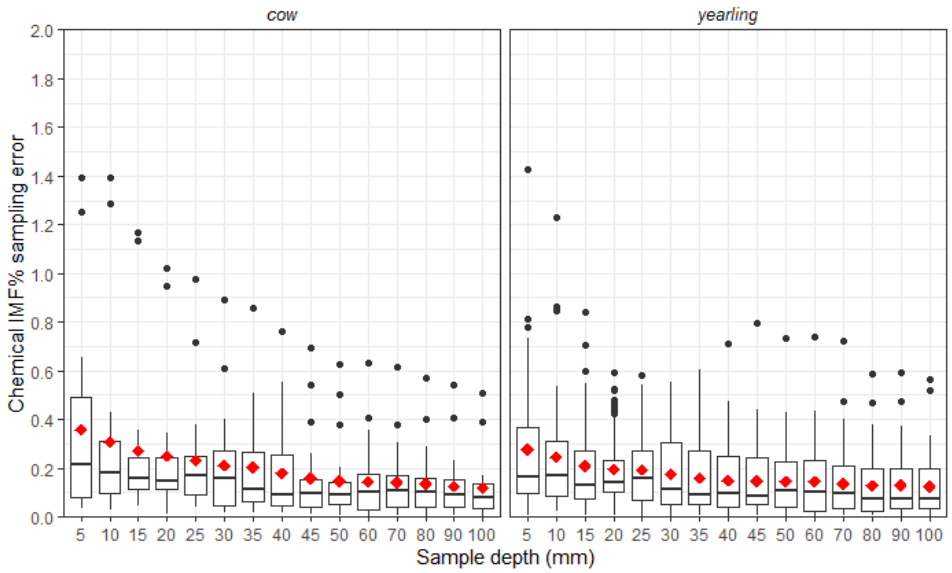

Figure 1. Boxplot showing the median, minimum, maximum, 1st and 3rd quartile and mean (diamond) for chemical IMF% sampling error with increasing sample depth (mm). Black icons (●) represent extreme observations

IV. CONCLUSION

Sampling error decreased rapidly with cumulative sampling and 15mm sample depth is sufficient to minimise chemical IMF% sampling error in striploins. Additional work using higher marbled striploins is required to quantify sampling error and sample size at higher levels of IMF%.

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