

SA Merino Sire Evaluation Site: 2020 drop carcass outcomes
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Summary

The SA Merino Sire Evaluation Site received support from the SA Sheep Industry Fund to collect carcass information on hard to measure traits associated with eating quality and lean meat yield for the 2020 drop wethers. 155 wethers from 18 sires which were processed at JBS Bordertown on 7th July 2021. Carcass measurements for hot standard carcass weight, GR Fat, Lean percent, Fat percent and Bone percent were undertaken. Samples for intramuscular fat percent and shear force were collected and processed. Predicted means are reported for each trait for each sire. Overall, carcasses were quite lean with low to moderate intramuscular fat percent and generally acceptable shear force. All data will be submitted to AMSEA for inclusion in wider genetic evaluation.

Introduction

The high price of lamb coupled with high consumer expectation has driven the urgency for the Australian lamb supply to ensure it is able to consistently supply high eating quality product. Good meat-eating quality is driven by multiple traits which are influenced by genetic and environmental effects. Two key traits are intramuscular fat (IMF%) and shear force. The percentage of intramuscular fat (IMF%) is a major determinant of eating quality. An increase in IMF% has been shown to correlate with increased consumer perception of juiciness, flavour and overall liking. Tenderness is measured as the force to cut through the cooked sample. Thus, the measures are actually toughness and so lower numbers are better. For good eating quality a benchmark of 4% intramuscular fat and a shear force of 49 Newtons or less has been proposed (Hopkins *et al.* 2006).

Project purpose and outcomes

- Collect individual animal data, including carcass traits and eating quality traits (intramuscular fat % (IMF%) and shear force (SF5)) for a subset of progeny of 18 rams.
- Contribute to the provision of an independent ram benchmarking service for merino sires within South Australia to inform on sire selection and increase breeding value accuracy of relatives through completion of the following activities:
 - 2020 McPiggery drop wether lambs to be processed
 - Information to be recorded for each carcass for weight, fat depth, lean meat yield
 - Individual animal IMF% and SF5 samples to be collected and analysed.

Methods

155 wether lambs from 18 sires were transported from McPiggery to JBS Bordertown for processing on July 7th 2021. Lambs were born and raised together with the exception of birthing paddocks based on pregnancy scan (single vs. twin). All lamb carcasses were manually tagged to link with electronic identification.

Abattoir measurements

Hot standard carcass weight (HSCW) was measured and recorded upon entering the chiller. Measurements of pH and temperature were recorded upon entrance, again 3 hours post

slaughter and 24 hours post slaughter. The pH and temperature of the lamb carcasses were measured by probe insertion in the left dorsal of the *M. longissimus lumborum* (LL). GR fat depth (mm) was recorded by using a GR knife that is inserted into the carcass at the 12th rib at approximately 110mm from the backline. These measurements were converted to fat score.

DXA is dual x-ray absorptiometry was used to measure carcass composition. The current method employed is that bone area is identified in the image and reported as such. This leaves meat and fat in the remaining image and the overall density of image indicates the proportion of lean vs fat.

The carcasses were kept in the chiller overnight at 0-4 °C. At 24 hours post-slaughter all lamb carcasses had the ultimate pH of the LL recorded. The carcasses then entered the boning room where the mid-loin was removed from the carcass at the 1st -6th thoracic vertebrae. Each mid-loin cut had a label that was linked to a specific carcass. Two samples of each mid-loin were taken, approximately 30g minced for IMF% analysis and approximately 65g sample for shear force analysis. The two samples types were stored in vacuum sealed bags and aged for 5 days at 4°C. After the 5 days the samples were frozen and stored in -20°C (Sheep CRC 2009).

Intramuscular fat and shear force analysis

Intramuscular fat percentage of *M. longissimus lumborum* as determined using the procedure of near infrared (NIR) of samples that are freeze-dried. The frozen shear force samples were cooked in a water bath at 71 °C for 35 minutes. To stop the cooking process the samples were placed in an ice bath for 15 minutes. A pre and post cook weight was recorded and the shear force measurements (Newtons) were taken by using a Lloyd LRX texture analyser fitted with a Warner-Bratzler head, with a crosshead speed of 100.00ml/min. The shear force value was recorded by the mean of six samples from the 65g *M. longissimus lumborum* sample. If the coefficient of variation was 24% or greater the median value is reported for the shear force (SF5) value (Sheep CRC 2009).

Statistical analysis

A sire model was fitted to estimate heritability and generate sire predicted means. Given all lambs were born, raised and processed together the only fixed effect was scanned single vs twin which accounted for birth type and paddock acknowledging that some twin born lambs would have been raised single. Average standard error is reported for each trait.

Results and discussion

Estimated heritability from a sire model was 34% for HCSW, 37% for GR fat, 22% for Lean%, Bone % and Fat %, 100% for IMF and 60% for shear force. For most traits these estimates are close to expectations. Estimated heritability for IMF% and shear force are high and likely a function of the small size of the data set. Sire predicted means are presented in Table 1 for HSCW (kg), GR fat (score 1-5), lean %, fat %, bone %, intramuscular fat % and shear force (newtons). For good eating quality a benchmark of 4% intramuscular fat and a shear force of 49 Newtons or less has been proposed.

Table 1. Sire predicted means for carcass traits

Predictions	HSCW	GR Fat	Lean%	Fat%	Bone%	IMF%	Shear force
Baderloo Poll, 180049	22.6	2.3	58.25	27.00	14.78	3.91	46.17
Calcookara Poll, 170060	21.3	2.1	58.07	27.26	14.70	3.53	45.03
Caroonboon, 181395	22.6	2.2	58.98	25.95	15.09	3.65	41.51
Challara Poll, 181063	22.9	2.4	58.71	26.33	14.98	2.86	42.37
Collandra North, 180645	21.7	2.2	58.53	26.60	14.89	3.73	43.45
Collinsville Poll, 130545 (Apollo)	22.5	2.4	58.27	26.96	14.79	2.92	44.14
Flairdale Poll, 180015	21.3	2.1	58.58	26.53	14.92	3.79	42.18
Glenville Poll, T88018	22.7	2.2	58.95	26.00	15.08	3.16	47.04
Hazeldean, 000113	21.8	2.1	58.00	27.35	14.67	4.44	41.47
Malleetech Poll, 188039	21.5	2.3	58.87	26.10	15.05	3.12	55.13
Mernowie Poll, 180500	21.8	2.1	58.71	26.34	14.97	3.50	47.07
Mumblebone, 170129	22.8	2.3	57.82	27.61	14.59	4.45	40.70
Old Ashrose Poll, 150445	21.2	2.1	59.68	24.95	15.39	2.97	45.66
Pepper Well Poll, 188187	22.1	2.2	58.90	26.07	15.05	3.64	43.51
Ramsgate, 180451	21.8	2.3	58.14	27.16	14.73	3.46	41.76
Ridgway Poll, 180157	21.5	2.2	58.09	27.24	14.70	4.00	41.85
Stockton, DB0074	23.2	2.4	58.92	26.03	15.07	3.43	39.54
Willandra Poll, 180080	21.9	2.1	59.19	25.65	15.18	2.59	41.48
Average standard error	0.98	0.09	0.55	0.79	0.24	0.33	3.25

Conclusion

The data collected in this project will inform Australian Sheep Breeding Values for key carcass and eating quality traits. Importantly, average performance for eating quality traits (IMF% and Shear force) was close to thresholds for acceptable eating quality. This highlights the importance of informed genetic selection coupled with management of growth path to maximise cohort performance relative to consumer expectations.

References

- Hopkins, D.L., Hegarty, R.S., Walker, P.J. and Pethick, D.W. 2006. 'Relationship between animal age, intramuscular fat, cooking loss, pH, shear force and eating quality of aged meat from sheep'. *Australian Journal of Experimental Agriculture*. 46:878-884.
- Sheep CRC. 2009. Sheep CRC Meat Phenotype Protocol. Version 1: 10th March 2009. Pp.43-48.

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Appendix

Heritability

In this trial only had observations on sires were obtained, due to the sire making up ¼ of additive genetic variance the following equation was used.

$$h^2 = \frac{(4 \times \text{sire variance})}{(\text{sire variance} + \text{residual variance})}$$