Impact of ewe genotype on sire breeding values in genetic evaluation of Merino body composition and components of reproduction

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There are anecdotal concerns among Merino breeders that Australian Sheep Breeding Values (ASBVs) of sires do not always predict performance when sires are used in a different genetic background, or in other words, when joined to different ewe genotypes (often referred to as "bloodlines"). Whilst previous analyses (Egerton-Warburton *et al*. 2019) found significant but small sire x ewe genotype interactions for post-weaning and hogget fleece traits in Merino sheep, it might be expected that heterosis is more likely to affect traits associated with fitness. Mortimer and Atkins (1997) found significant direct and maternal heterosis effects on component reproduction traits using data from a large crossing experiment. The extent to which these effects would be influencing Merino reproduction traits assessed in central test sire evaluation and on-farm progeny testing is, however, unknown.

Using data collected from the Merino Lifetime Productivity (MLP) progeny run at the Trangie Agricultural Research Centre, this study evaluated the relationship between predicted sire progeny means for live weight (LWT, kg), body composition traits (eye muscle depth (EMD, mm), GR fat (FAT, mm)) and reproduction (number of lambs born (NLB) and number of lambs weaned (NLW)). Data structure was described by Egerton-Warburton *et al*. (2019). A multivariate method (Gilmour *et al*, 2015), where the expressions within the progeny of each ewe bloodline were treated as individual traits was employed. With sires fitted as random effects, the correlation between sire effects is an estimate of the genetic correlation between performance in each bloodline. Analysis accounted for fixed effects of birth type, rearing type, and management group whilst fitting a random sire effect. The effect of reproduction on adult expression of body composition was tested by fitting conception to the model.

Correlations between predicted sire progeny means for each bloodline for body composition traits (LWT, EMD and FAT) at yearling and hogget ages were all greater than 0.94. At the adult stage, correlations ranged from 0.73 to 0.91 (Table 1).

	LWT	EMD	FAT	NLB	NLW
Yearling	0.96 ± 0.15	0.99 ± 0.08	0.94 ± 0.10	-	-
Hogget	0.98 ± 0.19	0.98 ± 0.08	0.98 ± 0.09	-	-
Adult	0.73 ± 0.34	0.91 ±0.1	0.84 ± 0.17	0.78 ± 0.59	0.88 ± 0.68

Table 1. Correlations estimated for body composition and reproduction traits assessed in two different ewe bloodlines.

When sires were joined to these ewe bloodlines, their progeny generally maintained their relative ranking across a range of objective liveweight and body composition traits, and across the age stages. This investigation of genotype x genotype interaction within an environment has demonstrated that limited re-ranking occurs across ewe bloodlines for growth and carcase traits. These results suggest that Australian Sheep Breeding Values for these traits will reliably predict performance when sires are mated to ewes from different genetic backgrounds.

Correlations for reproduction traits NLB and NLW suggest limited re-ranking of sires when crossed with these two ewe bloodlines. Additional data from another maiden joining, together with repeat reproduction data will enable further investigation of the potential for re-ranking for component and compound reproduction traits. However, this preliminary analysis suggests that ASBVs for these reproduction traits will reliably predict performance when sires are mated to ewes from different genetic backgrounds.

References

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