VARIATION IN MERINO WETHERS FOR GROWTH AND CARCASE TRAITS

S.J. Martin[1], C.A. Wilson[2], M.J. Moses[3], R. van de Ven[4] and D.L Hopkins[5]

[1]Industry & Investment NSW, Young NSW 2594
[2]Craig Wilson & Associates, Wagga Wagga NSW 2650
[3]Moses & Son Wool Brokers, Temora NSW 2666
[4]Industry & Investment NSW, Orange Agricultural Research Station, Orange NSW 2800
[5]Industry & Investment NSW, Centre for Red Meat and Sheep Development, Cowra NSW 2794

ABSTRACT

The Peter Westblade Memorial Merino Challenge (PWMMC) is a successful collaboration between private industry and Industry & Investment NSW. The PWMMC is based on the evaluation of 50 wether teams from across Australia and has successfully integrated finishing and key carcase and meat quality traits into the standard Merino wether trial protocol. Early results from the PWMMC have demonstrated that Merino wethers have sufficiently fast growth rates and their carcases meet market specifications in terms of carcase weight and fat score at slaughter when fed intensively. Furthermore, analysis of various meat quality parameters indicates that meat from Merino wethers can attain acceptable levels for traits like colour and pH.

INTRODUCTION

The Peter Westblade Memorial Merino Challenge (PWMMC) has been a collective wether trial set up between private industry and Industry & Investment NSW. The Challenge has attracted 50 teams of 30 wethers from across Australia. The Challenge has aimed to address the growing interest in carcase traits amongst Merino breeders whilst still maintaining a focus on wool traits. Carcase traits, in particular liveweight have previously only been valued at the conclusion of a wether trial when the animals are 3 to 5 years of age.

There is clear evidence that Merinos take longer to reach target weights (Hopkins *et al*. 2007a) than other types and some anecdotal claims that they produce dark cutting meat. Although this latter claim appears unfounded (Fogarty *et al*. 2000; Hopkins *et al*. 2007b) when Merinos are grown and slaughtered with other types, there is some evidence that the formation of metmyoglobin in the loin muscle from Merino lambs occurs quicker and to a greater extent than muscle from the other types (Warner *et al*. 2007). Merino lambs under many situations also produce meat with a higher pH (Hopkins *et al*. 2007b).

The PWMMC offered the opportunity to examine the benefits of intensively feeding Merino lambs representing a wide range of bloodlines and at the same time communicate to Merino breeders the relative importance of carcase and meat traits for meat production. The PWMMC 2010-2012 was developed to assist Merino breeding operations make more informed decisions about their Merino genetics.

Project Background. The Challenge was named in honour of Peter Westblade, who was passionate about breeding profitable sheep, continually had a thirst for knowledge and mentored others in the industry. The Challenge is a collective effort between two commercial businesses, I&I NSW staff and 15 other supporting businesses and organisations.

The Wool Challenge is being run at the Temora Research and Advisory Station as a standard wether trial and will have two assessment shearings in April 2011 and 2012.

The Meat Challenge is a new initiative within wether trials. Half the Merino lambs (50 teams of 15) where randomly selected and taken to Collingullie NSW where they were de-pastured for 4 weeks on irrigated lucerne and then put into a feedlot. The feedlot ration included an introductory

feeding program for 3 weeks with barley grain, cereal and lucerne hay and a full pellet ration for 8 weeks containing 11 MJ/kg DM Metabolisable Energy and 14.5% Crude Protein.

MATERIALS AND METHODS

The design was developed by I&I NSW staff. Initial work determined the number of animals required per team given varying numbers of teams to achieve a 95 percent chance of detecting team differences. This work formed the basis for the minimum number per team (15) required for both the wool and meat sections of the PWMMC and was consistent with previous work (Rogan 1988).

A liveweight was taken prior to an even-up shearing. This was then used to randomly allocate animals from each team to the Wool and Meat Challenge. Each team of 30 Merino lambs was randomly split to ensure an even distribution of liveweight to both the Meat and Wool Challenge. In the feedlot 5 pens where used. A liveweight collected in early June 2010 was used to randomly allocate wethers from each team to each pen. In each feedlot pen there were three wethers from each team consisting of a low, medium and high liveweight animal. The pen allocation was used to remove any "pen effect" from team comparisons. To minimise any issues associated with social dominance or stress, pre-training onto self feeders was undertaken and adequate trough space per lamb was accommodated

The Merino lambs were processed at Fletcher International Exports Pty Ltd in Dubbo. The logistics of transport, processing and data collection required two kill days. To reduce any "kill day effect" on team comparisons, individuals within teams where randomly allocated to kill days. A liveweight collected close to the processing date was used to assign individuals to kill day. Each team had a random allocation of individuals within each weight range to each kill day. This allocation to kill day, in addition to improving the power of the analyses, aimed to avoid any disadvantage to a team due to misadventure occurring between leaving the feedlot and processing.

The traits measured over duration of the Meat Challenge which ran from April to August 2010 are listed in Table 1.

Table 1. Trait measured in the PWMMC Meat Challenge

Liveweight and growth traits
Liveweights (7 in total)
Final body weight (kg)
Age (mouthed – lamb/hogget) – prior to slaughter and at slaughter
Carcase traits
Carcase weight (kg)
Dressing percentage – derived from final body and carcase weight
Fat depth at GR (12^{th} rib) (mm)
Eye muscle area (12^{th} rib) (cm^2) – by measuring the depth and length at the same position as Fat C
pH – of the longissimus at the 12^{th} rib (an ultimate pH) – 24 hour
Colour - Meat colour (L^*, a^* and b^*)
Skin
Skin length (mm)
Wool Grade (fine [1], medium [2], broad [3])
Body wrinkle (external – 1 to 5)
Skin wrinkle (internal – 1 to 5)
Body length (cm)

A linear mixed model (LMM) analysis was used to analyse the results from the experiment and a number of models were applied depending on the trait. Models were fitted using ASReml (Gilmour *et al*. 2006). For example, the model fitted for a carcase trait was trait = baseline + Pen + KillDay + CarcaseWt + Team + error where Team and error were fitted as uncorrelated random effects.

RESULTS AND DISCUSSION

The real challenge with the meat aspect of the Challenge was the varying age of lambs entering the feed lot, pre experimental nutrition and management and the varying Merino types entered. Liveweights were measured on the lambs 7 times over the duration of the Meat Challenge. Six of those weights were used to generate an average team growth rate. Team average growth rates ranged from 137 to 204 grams per day adjusted for age. The growth rate for animals ranged from 9 to 321 grams per day. There was a significant difference in growth rates between the top 10 and bottom 8 teams based on a 95 percent confidence of a difference between teams. This work highlights the opportunities within the Merino industry when placing emphasis on growth in the breeding objective and providing appropriate nutrition.

Carcase traits. The market specifications at the time of processing were 22 to 26 kg (carcase weight) with a 2 to 4 fat score. Twenty seven of the 50 teams met the weight and fat specifications. All 27 teams had a fat score 3 (11 to 15mm). The teams that fell outside the market specifications were largely confounded by the age at entry into the Challenge.

The team means for eye muscle depth (EMD), eye muscle width (EMW) and eye muscle area (EMA) ranged from 25.3 to 29.3mm, 58.3 to 65.2mm and 12 to 15.3 centimetres square respectively, after adjusting for carcase weight. Comparing eye muscle results with body length there was a greater change (wider) in EMW as body length increased. Body length increases can also be associated with increases in age (Ponnampalam *et al*. 2007). It has also been reported that there is no increase in EMD past the age of 14 months, regardless of breed (Ponnampalam *et al*. 2007). However beyond 14 months there is a continued increase in EMA indicating an increase in EMW and change shape of the eye muscle (Ponnampalam *et al*. 2007).

Ninety four percent of the teams had an average Fat GR between 6 and 15 mm. The average GR was 11.8mm and Fat C was 5mm at adjusted carcase weights within each team. There were no pens effect on GR and Fat C. The best performing team for combined GR and carcase weight had a mean GR of 14 ± 0.65 mm at 25.9 kg which was significantly fatter than for the Merinos slaughtered by Ponnampalam *et al*. (2007), and probably indicates the extensive finishing regime.

Meat Traits. Merinos are often associated with high pH levels (Fogarty *et al*. 2000). pH has an effect on meat colour and shelf life. The results for pH showed very little to no difference between teams for pH. The average pH for animals was 5.6 with standard deviation equal 0.11. Of the individual pH results only 3.5 percent of the Merino wether lambs processed were above 5.8 pH, the value above which reduced shelf life is expected (Egan and Shay, 1988).

The average lightness (L^*) for the loins was 36.8. Values less than 34 are undesirable as consumers consider the meat too dark (Khliji *et al*. 2010). Out of the Merino lambs there were only 3 percent of lambs that had L^* values less than 34. Above 44 you have 95 percent confidence that any random consumer will accept the colour (Khliji *et al*. 2010), but none of the teams or lambs reached this level. The a* values reflect the redness of the meat. The higher the a* value the redder the meat. It also reflects the age of the animals at slaughter with a* values increasing as animals become older (Hopkins *et al*. 2007b). All team values where excellent for this measurement. The average for all teams was 21.4 with very little difference between teams. To achieve a 95 percent confidence that random consumers will be satisfied the a* value needs to be

above 14.5 (Khliji *et al*. 2010). Colour is important to processors and retailers, but does not have direct influence on the price producers are paid.

CONCLUSION

Early results have provided some excellent messages for both project entrants and the wider sheep industry.

The significance of this work has demonstrated that there are massive opportunities in the Merino industry. These opportunities will come from improvement using selection for both carcase and wool traits, but it is also apparent that Merinos can, provided they have adequate nutrition, produce a quality meat product.

The key for the Merino industry will be to continue to focus on the key profit drivers of fibre diameter, fleece weight, growth and reproduction being careful not to get too distracted with side issues. However given some industry bias against Merinos for meat, producers must carefully select how they market their Merino lambs.

ACKNOWLEDGEMENTS

This Challenge would not have been possible without the support and collaboration of a number of organisations, businesses and individuals and we also thank Meat and Livestock Australia for their support to collect carcase and meat quality data.

REFERENCES

Egan A.F. and Shay B.J., (1988) *In Proc. 34th Int. Cong. Meat Sci. Tech.,* pp. 476, Brisbane, Australia.

Fogarty N.M., Hopkins D.L. and van de Ven R. (2000) 2. Carcass characteristics. *Anim. Sci.* **70:** 147.

Gilmour A.R., Gogel B.J., Cullis B.R. and Thompson R. (2006) *ASReml User Guide Release 2.0*. VSN International Ltd, Hemel Hempstead, HP1 1ES, UK.

Hopkins D.L., Stanley D.F., Martin L.C. and Gilmour A.R. (2007a). *Australian Journal of Experimental Agriculture* **47:** 1119.

Hopkins D.L., Stanley D.F., Martin L.C., Toohey E.S. and Gilmour A.R. (2007b). *Australian Journal of Experimental Agriculture* **47:** 1155.

Khliji S., van de Ven R., Lamb T.A., Lanza M. and Hopkins D.L. (2010) *Meat Science Meat Science* **85:** 224.

Ponnampalam E.N., Hopkins D.L., Butler K.L., Dunshea F.R. and Warner R.D. (2007) *Australian Journal of Experimental Agriculture* **47:** 1147.

Rogan I.M. (1988) *Proceedings - Sheep & Wool Conference and Refresher course*, Orange, 13-1.