

# Feeding unsalable carrots to Merino lambs in a total-mixed ration maintains wool yield and staple strength

D.L. Forwood<sup>A,C</sup>, A.V. Chaves<sup>B</sup> and S.J. Meale<sup>A</sup>

<sup>A</sup>School of Agriculture and Food Sciences, Faculty of Science, The University of Queensland, QLD, 4343 Australia

<sup>B</sup>School of Life and Environmental Sciences, Faculty of Science, The University of Sydney, NSW 2006 Australia

<sup>C</sup>Email: d.forwood@uq.edu.au

Food waste costs Australians \$20 billion per year (Kelton 2019), with vegetables comprising approximately 29% of total waste (Reutter et al. 2017). More specifically, one-third of carrots produced are discarded due to industry-wide aesthetic standards (Stuart 2009). Fresh carrots are an energy-dense feedstuff (13.76 MJ metabolisable energy/kg dry matter (DM)), containing 10% crude protein (Wadhwa et al. 2013), and have not previously been fed to ruminants in a total-mixed ration (TMR). The objective of this study was to determine the influence of a TMR including unsalable carrots on wool quality in Merino lambs. It was hypothesised that feeding carrots in a TMR would have no effect on wool yield or staple parameters.

Thirty-four 7-month old Merino wether lambs were blocked by live weight and randomly assigned within each block to an experimental diet comprising of 1) control (n = 16; 50.2% barley grain, 42.0% lucerne hay, 7.2% canola meal, 0.6% mineral mix); or 2) carrot (n = 18; 45.9% carrot, 8.7% barley grain, 30.0% lucerne hay, 15.2% canola meal, 0.2% mineral mix) on a DM-basis. Individually housed lambs were adapted to the trial diets for 14-days. Wool growth was measured using the dye-band technique (Meale et al. 2014), whereby a band of black commercial hair dye was applied to the mid-side of each lamb on Day 0. After an experimental period of 11-weeks, wool was clipped from the dye-band site and analysed for wool yield and quality parameters. The MIXED procedure of SAS was used to analyse wool characteristics, with treatment as fixed effect, and animal within treatment as a random effect.

**Table 1. Wool characteristics of lambs fed a grain-based control or carrot-based total mixed ration.**

	Control	Carrot	SEM	P-value
Wool yield, %	72.0	72.1	0.65	0.91
Fibre diameter, $\mu\text{m}$	16.1	15.7	0.22	0.22
Coefficient of variation of diameter, %	19.0	18.1	0.40	0.12
Staple length, mm	63.7	65.1	1.50	0.51
Staple strength, N ktex	33.1	33.1	3.24	1.00
Curvature, deg / mm	105	101	2.33	0.21
Spinning fineness	15.4	14.9	0.21	0.12

As hypothesised, wool yield and staple parameters, among other quality traits were similar between control and carrot-fed lambs ( $P = 0.12$ ; Table 1). Given wool is a proteinaceous fibre, this suggests that protein was not a limiting factor between either TMR, as diets were formulated to be iso-nitrogenous (CP = 15%) and iso-caloric. Similar wool yields between lambs have also been observed in studies replacing lupins or lucerne hay with fresh citrus pulp up to 30% DM (Fung et al. 2009; Sparkes et al. 2009). Further, the quality of wool produced in this study can be defined as superfine (fibre diameter  $\approx 18.5 \mu\text{m}$ ) and is highly valued in the knitted textile sector (Cottle and Fleming 2016). In conclusion, unsalable carrots in a TMR at up to 46% DM can successfully maintain wool growth and quality characteristics in superfine Merino lambs.

## References

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