GENETIC DIVERSITY AND BREED COMPARISON OF CARCASS TRAITS IN TASMANIAN CORRIEDALE AND EAST FRIESIAN SHEEP BY RAPD MARKERS

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Introduction

The Australian lamb meat industry exploits crossbreeding in which some 40% of the annual slaughter of about 18 million lambs is first cross progeny from terminal sire meat rams mated to Merino ewes (Fogarty *et al.*, 2005a). However, research has shown that even though the Merino breed is leaner and has reasonably comparable eye muscle area with other meat breeds (Fogarty *et al.*, 2003), carcasses from Merinos have poorer acceptability and high meat pH due to their greater susceptibility to pre-slaughter stress (Fogarty *et al.*, 2000). As a result of the ever-increasing consumer demands for meat products that meet their specifications, the farmer needs to constantly explore diverse breed combinations that best meet such demands. In Tasmania, the Corriedale and East Friesian breeds constitute a significant proportion of the dual-purpose prime lamb breeds, hence an improvement in the genetic merit of their carcass and meat quality traits has the potential to substantially increase the productivity and value of the industry. The objective of this paper was to provide some preliminary information on carcass quality measurements in Corriedale and East Friesian prime lambs produced in Tasmania and to explore the utilisation of RAPD markers for studying the genetic variation between breeds.

Materials and Methods

Two hundred East Friesian and Corriedale prime lambs were commercially slaughtered in a Tasmanian abattoir and their DNA extracted and screened with nine RAPD markers whose primer sequences are shown on Table 1.

Table 1: RAPD primers, sequences and guanine + cytosine (GC) percentage.

Primer	5' to 3' sequence	GC%
A1	GCACTGAGTA	50
A2	ACGTCGAGCA	60
A5	GAATCGGCCA	60
P1	ACAACGCCTC	60
P2	GGGAACGTGT	60
P3	CTGGGCAACT	60
P4	CCGTGACTCA	60
T3	GCTGCTCGAT	64
T4	ACCGCGGTCT	64

Details of the laboratory procedures of genomic DNA extraction, polymerase chain reaction assays, gel electrophoresis, RAPD band scoring and analyses have been published elsewhere (Malau-Aduli *et al.*, 2006). The carcass data were subjected to a one-way analysis of covariance in which breed was fitted as a fixed effect and slaughter day as a covariate utilising the SAS statistical software. Pairwise t-test between means was computed.

Results and Discussion

At the same slaughter weight and body condition score, Corriedales had significantly ($P<0.01$) higher fat score, thicker subcutaneous fat (29.6 vs 23.3 mm) and wider eye muscle (49.8 vs 36.2 mm) than East Friesians (Figure 1). On the other hand, East Friesians had significantly ($P<0.01$) heavier hot carcass weight (23.8 vs 22.3 kg), larger eye muscle area (42.9 vs 39.5 cm^2) and longer eye muscle (67.1 vs 65.6 mm) than Corriedales, while shortloin length (SLL) in the two breeds did not significantly differ ($P>0.09$). These results are consistent with those of Fogarty *et al.*, (2005b) that reported significant sire breed differences in hot carcass weight, carcass fat and eye muscle area between Border Leicester, East Friesian, Corriedale, Finnsheep, Coopworth, White Suffolk and Booroola Leicester. RAPD marker assays are based on polymerase chain reaction amplification of random segments of the DNA with an identical pair of

primers 8-10 bp in length consisting of arbitrary nucleotide sequence (Rabouam *et al.*, 1999; Liu and Cordes 2004). Genetic variation and divergence within and between breeds of interest are assessed by the presence or absence of each product which is dictated by the DNA sequence at each locus. The power to detect polymorphisms is very high given that 5-20 bands (Figure 2) can be produced using a given primer pair and multiple sets of random primers can be used to scan the entire genome for differential RAPD bands. RAPD has several advantages over other molecular markers because it can be used with uncharacterised genomes without prior knowledge of nucleotide sequence information and can be applied to problems in which only small quantities of DNA are available. It is also efficient and inexpensive.

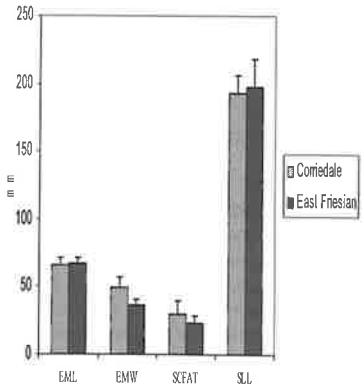

Figure 1: Variations in eye muscle length (EML), eye muscle width (EMW), shortloin length (SLL) and subcutaneous fat thickness (SCFAT) ± s.e. (mm) of East Friesian and Corriedale carcasses.

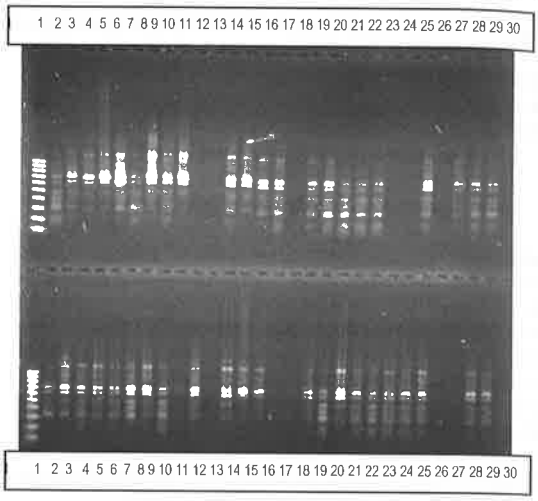

Figure 2: Differential RAPD bands utilising marker A2 in Corriedale (Upper Row) and East Friesian (Lower Row) sheep. Lane 1 is the 100bp DNA size ladder.

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