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BRIEF COMMUNICATION: Effect of red wine lees on lamb meat quality

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INTRODUCTION

Oxidative processes in fresh red meat can cause detrimental effects on the keeping and eating qualities of meat as well as its nutritional value (Bekhit & Faustman, 2005; Bekhit *et al*., 2007). Several supplement feeding strategies have been shown to improve the colour stability of fresh meat during display such as Vit E (Faustman *et al.*, 1989) and condensed tannins (Luciano *et al.,* 2009) feed supplementation. Red wine is known for its high antioxidant activity which is largely attributed to its phenolics contents (German & Walzem, 2000). Wine lees is a rich source of tannins and polyphenols. These compounds act as antioxidants and have been accredited for some of the acclaimed health benefits of red wine. These compounds, when delivered via forages, have also been shown to be able to reduce the burden of parasites in sheep (Niezen *et al*., 1995). This investigation was part of a larger trial studying the effects of red wine lees on parasitism in lambs and meat quality of lamb.

MATERIAL AND METHODS

A total of 80 lambs were grazed as one mob on an organic farm between the period of 24 March and 21 April 2010 and assigned to four sets of treatments containing 20 animals per treatment.

1. Control (no drench/no extra feed);
2. Lucerne pellets fed;
3. Lucerne pellets fed + drenched with Matrix (10 mL of a combination anthelmintic containing 1.0 g abamectin, 40 g levamisole and 22.7 g Oxfendazole per mL (Matrix C, Merial Ltd., New Zealand) on Day 0 and Day 12 and 100 mL water on each other day;
4. Lucerne pellets + lees fed.

The feed for the lees group was Lucerne commercial feed after mixing with 200 mL of lees/kg feed (460 mg tannins/day/animal or ~ 0.05% dry matter) followed by overnight drying at 60°C with an allowance of 0.5 kg/animal. The animals were grazed for 28 days on the same paddocks and were separated into their experimental groups in the afternoon and had access to different pellet treatments between 20:00 h and 06:00 h on the next day. The animals were slaughtered at the Alliance Matarua plant and the carcass grade traits (V-GR tissue depth (mm), leg yield (%), loin yield (%), shoulder yield (%) and total yield (%)) were measured using ViaScan. The meat quality of the loin muscles was measured at one day post-mortem except the colour measurements and a repeat pH measurement which was carried out on the samples after eight weeks of vacuum packaging storage at 2°C. The pH, tenderness and colour measurements (L*, a*, b*) and hue angle, were carried out as described by Bekhit *et al*. (2003). The sensory evaluation was carried out by a panel of eight experienced evaluators using nine-point descriptive rating scales (1.00, 1.25, 1.5, 1.75, 2.00, 2.25, 2.50. 2.75 and 3.00) anchored to off taint to clean fresh meaty smell (Aroma); off/rancid flavours to strong flavour (Flavour); tough/chewy to low resistance to the bite and minimal fibrous resistance (Texture); consistently dry and absence of juices to succulent and adequately juicy on chewing (Succulence), and dislike extremely to like extremely (Overall acceptability). Statistical analysis was performed with Minitab® Software (Version 16.0, Minitab Inc., Pennsylvania, USA). The data were analyzed using analysis of variance to determine the effects of treatments on the measured parameters. The general linear model was used with all the data. Colour results were treated as a repeated measurement analysis of variance. Significant differences among the means were determined using Tukey multiple comparison test in the GLM protocol at a confidence level of 95% ($P < 0.05$).

RESULTS AND DISCUSSION

The animals' performance results have been reported by Bekhit *et al.* (2011). There were no effects of lees on the meat pH at 24 hours postmortem and after eight weeks of vacuum storage (Table 1). Also there were no effects on the meat tenderness and sensory attributes (Aroma, Flavour, Texture, Juiciness and Overall acceptability) (Table 2). The discolouration rate of the meat from animals (Hue angle) feed on lees tended to be lower than meat from the Control animals at the end of the display time (Figure 1).

TABLE 1: Average ± standard error of the difference for pH at 24 hours (pH_{24h}) and eight weeks (pH_{8w}) post-slaughter, cold carcass weight, carcass V-GR tissue depth, leg yield, loin yield, shoulder yield and total yield for the carcass of lambs grazed lambs grazed on organic pasture (Control), or treated with organic pasture and lucerne pellet feeding, organic pasture, lucerne pellet feeding and Matrix drenching or organic pasture, lucerne pellets and wine lees feeding for 28 days.

Treatments	pH_{24h}	pH_{8w}	Cold carcass weight (kg)	V-GR score (mm)	Leg yield (%)	Loin yield (%)	Shoulder yield (%)	Total yield (%)
Pasture (Control)	5.58 ± 0.02	5.61 ± 0.03	16.0 ± 0.5^{a}	4.3 ± 0.9^{a}	23.0 ± 0.5	14.5 ± 0.3	17.2 ± 0.3	54.7 ± 0.9
Pasture + Lucerne	5.60 ± 0.02	5.61 ± 0.03	15.5 ± 0.5^{a}	3.3 ± 0.9^{a}	23.2 ± 0.5	14.5 ± 0.3	17.1 ± 0.3	54.7 ± 0.9
Pasture + Matrix + Lucerne	5.57 ± 0.02	5.60 ± 0.03	17.3 ± 0.5^{b}	6.5 ± 0.9^{b}	22.3 ± 0.5	14.4 ± 0.3	17.2 ± 0.3	53.9 ± 0.9
Pasture + Lees + Lucerne	5.60 ± 0.02	5.63 ± 0.03	15.9 ± 0.5^{a}	4.3 ± 0.9^{a}	22.8 ± 0.5	14.2 ± 0.3	16.9 ± 0.3	54.0 ± 0.9

[a-b] Means within each column that have a different superscript are significantly different ($P < 0.05$)

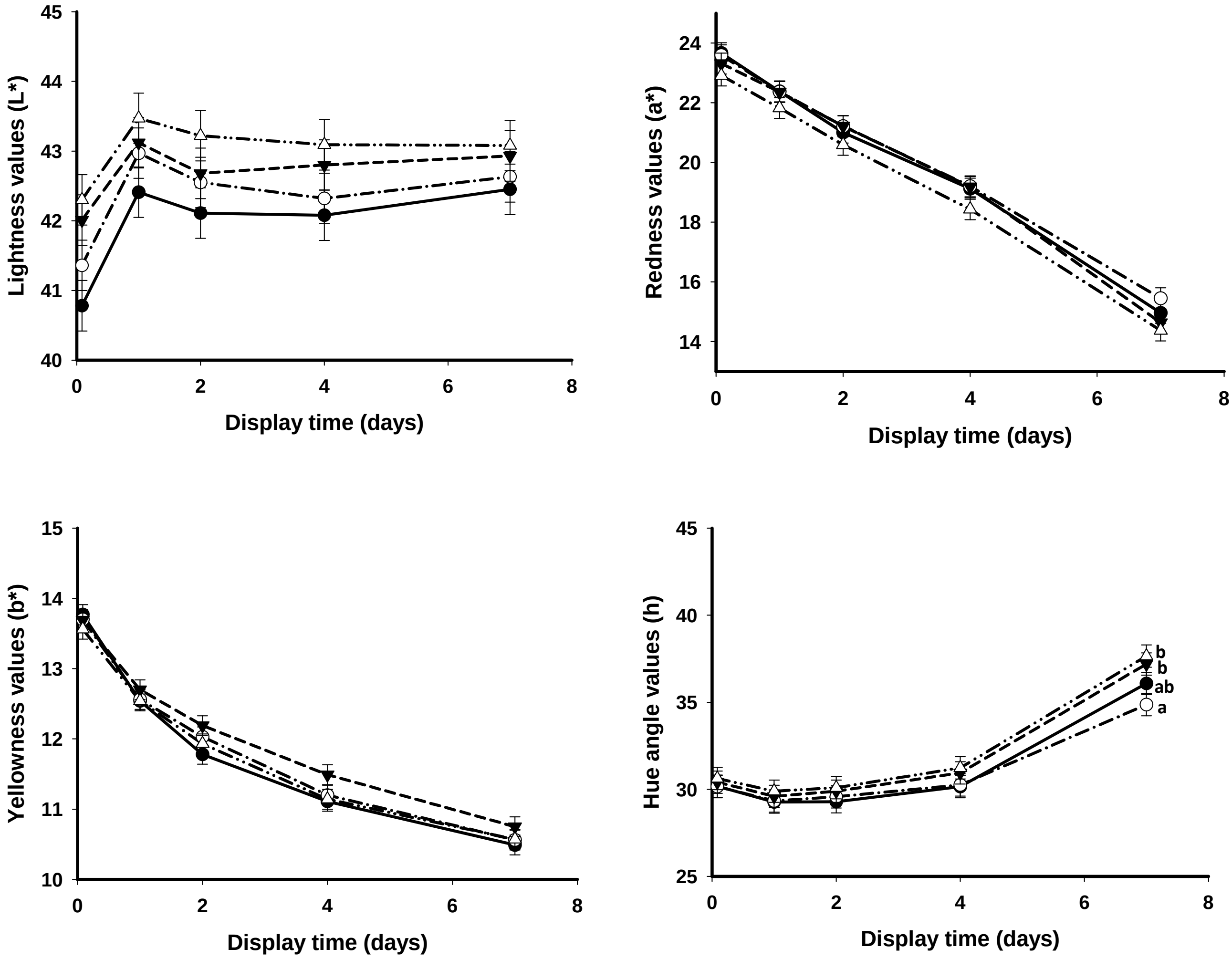
TABLE 2: Average ± standard error of the difference for instrumental tenderness and sensory scores for loin muscles of lambs grazed lambs grazed on organic pasture (Control), or treated with organic pasture and lucerne pellet feeding, organic pasture, lucerne pellet feeding and Matrix drenching or organic pasture, lucerne pellets and wine lees feeding for 28 days. The nine-point sensory scores were anchored from off taint to clean fresh meaty smell (Aroma); off/rancid flavours to strong flavour (Flavour); tough/chewy to low resistance to the bite and minimal fibrous resistance (Texture); consistently dry and absence of juices to succulent and adequately juicy on chewing (Succulence), and dislike extremely-like extremely (Overall acceptability) measured 24 hours post-mortem.

Treatments	Tenderness (kgf)	Aroma	Flavour	Texture	Succulence	Overall acceptability
Pasture (Control)	10.71 ± 0.74	2.62 ± 0.03	2.46 ± 0.03	2.33 ± 0.05	2.42 ± 0.04	2.39 ± 0.04
Pasture + Lucerne	10.57 ± 0.74	2.59 ± 0.03	2.48 ± 0.03	2.42 ± 0.05	2.46 ± 0.04	2.46 ± 0.04
Pasture + Matrix + Lucerne	9.34 ± 0.74	2.63 ± 0.03	2.49 ± 0.03	2.46 ± 0.05	2.45 ± 0.04	2.46 ± 0.04
Pasture + Lees + Lucerne	9.92 ± 0.74	2.60 ± 0.03	2.45 ± 0.03	2.42 ± 0.05	2.45 ± 0.04	2.43 ± 0.04

The effect was not statistically significant. Fresh meat has a short retail life due to the rapid onset of oxidative processes. This provides a challenge for the meat industry as to how they can extend it. Meat discolouration also causes significant financial losses for the meat industry due to marked down prices, repackaging, ground, marination or discarded product. Average losses of sales, due to colour deterioration, for USA meat industry have been reported as 3.7% for the entire meat department and 5.4% for fresh meat (Williams *et al.*, 1992). Preventing this loss by increasing the shelf-life of meat by one or two days would save the US industry an estimated $1 billion annually (Williams *et al.*, 1992). Within the New Zealand market, between 2% and 4% is either discounted or discarded and 6% to 8% is marinated or minced (J. Dawber, Personnel communication).

Increasing the antioxidant capacity of muscle through dietary supplementation has been shown to be a promising method to increase the colour stability of fresh meat (Luciano *et al.*, 2009). Some vital antioxidants, such as resveratrol, can precipitate from red wine during lees formation and be removed with the lees during the racking step. Resveratrol was an effective antioxidant in improving the colour stability of beef patties during aerobic display (Bekhit *et al.*, 2003). The amount of lees that were added to the feed equates to only 460 mg tannins/day/animal or ~ 0.05% dry matter. A positive effect on lamb colour stability has been reported with tannins at a level of 40 g/kg dry matter or ~ 0.4% dry matter (Luciano *et al.*, 2009). It could therefore be expected that better improvements in colour stability could be achieved by delivering a higher dosage of lees.

FIGURE 1: Plots of changes in time post slaughter of the mean instrumental colour measurements of L*, a*, b* and hue angle for loin muscles of lambs grazed on organic pasture (Control, Δ), or treated with organic pasture and lucerne pellet feeding (▼), organic pasture, lucerne pellet feeding and Matrix drenching (**○**) or organic pasture, lucerne pellets and wine lees feeding (●) for 28 days.



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