Radical vitamins: Improving lamb meat quality by feeding vitamin E

Australian lamb meat is a premium product valued by Australian consumers and exported widely across the world. An important limitation to the efficiency of the Australian lamb meat supply chain is the rapid browning of lamb meat when it hits the supermarket shelf. Once exposed to oxygen, lamb meat browns at a rapid rate, much faster than other red meats such as beef. This is a problem because consumers expect and demand a red colour in meat, so despite being of otherwise premium quality, lamb meat can only be kept on the shelf for around 2 days currently, before retailers are forced to discount or downgrade the product before it browns. This results in large economic losses for the Australian lamb meat industry as a whole, and is a particular problem in lamb meat that is stored for up to 2 months during export to distant markets such as the USA.

One potential solution to this problem is to feed lambs the antioxidant vitamin E, which acts to combat the oxidation of myoglobin pigments in lamb meat that causes browning. The ability of Vitamin E to combat the enhanced browning of exported Australian lamb is unknown.

Methods and results

132 lambs of mixed breed type (Terminal, Maternal or Merino) of known genetics were selected for a vitamin E feeding trial. The lambs were removed from green pasture for 2 weeks prior to acclimatisation onto a complete pelleted ration before they were randomly divided into high and low vitamin E treatment groups (275 or 30mg of vitamin E/kg feed). The lambs were penned in groups of 11 (6 groups per treatment) and fed their designated ration for 8 weeks prior to slaughter at an average live weight of 56kg. At 24 hours post-mortem, the loin muscle was extracted for measurement of vitamin E concentration and colour over retail display.

Three large samples of the loin were collected per lamb and stored vacuum packaged at -1°C for 5, 35 or 70 days to mimic standard domestic, short export and long export storage scenarios. After storage the loin meat was freshly sliced to create a fresh meat surface, which was then wrapped with oxygen-permeable film and placed under simulated retail display conditions for 3 days. The surface colour of the meat was then measured 24 hourly using a Hunterlab spectrophotometer which measures meat surface redness via light reflectance at different wavelengths (630/580nm).

This ratio depicts the degree of browning of the meat, with lower numbers representing browner meat and higher numbers representing a redder meat surface.
Dietary vitamin E supplementation successfully delayed the rate of lamb loin meat browning during display following all storage periods tested in this study (Figure 1). However contrary to our expectations, the extent that vitamin E reduced meat browning was less following very long storage than after short or medium storage periods (Figure 2).

We also found that high vitamin E improved the initial redness of short-stored meat during display in addition to delaying the browning of the meat over the subsequent days on display.

Conclusions and recommendations

This study shows that dietary vitamin E supplementation is an effective strategy to combat the rapid browning of lamb meat during retail display in domestic and exported product. While the impact of vitamin E was less in very long stored product, this simple, natural and economic practice of vitamin E supplementation could still gain an additional 8–12 hours of shelf life for this premium exported product, and would therefore be economically worthwhile.

These results demonstrate that vitamin E supplementation is more beneficial for domestic product, granting an additional 12–24 hours of shelf life by delaying browning as well as improving the redness of the product and thus visual appeal to the consumer when initially placed on display. These findings are currently being circulated to owners of feedlots and prime lamb farmers to encourage vitamin E supplementation of lamb herds in order to increase the value, reduce wastage and ultimately improve the efficiency of the Australian lamb meat supply chain.

More information

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References


Authors

1. Department of Agriculture and Food, Western Australia.