THE EFFECT OF EARLY WEANING AND INTENSIVE FEEDING ON MEAT QUALITY OF BEEF CATTLE

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Background

Meat quality, like artistic beauty, starts in the eye of the beholder (colour, packaging, edible tissue). But in addition to the eye meat quality also depends on the palate. From a number of consumer surveys (Hearnshaw *et al.*, 1995; SMART, 1993), mea tenderness was regarded as the single most important component of meat quality for the consumer, and therefore the mechanism involved in manipulating this aspect are of major importance in meat production. Amongst the numerous factors involved in mea tenderness, restricting the variation in age of the animal, should lead to more consistent tenderness especially for muscle with hig collagen content (Bouton *et al.* 1978). In addition, feeding cattle intensively thereby sustaining high rates of protein turnover over period of time, should also result in more tender meat. According to recent research in Australia (CRC, MLA-report, Novembe 1998), meat from pasture fed animals were less tender than from grain fed animals.

Objectives

This study determined the effect of early weaning (ca. 3 months compared to 7 to 9 months) and prolonged intensive feeding (15 days compared to 90 days) on the eating quality and colour shelf life of beef.

Methods

Twenty crossbred steer calves selected from the "Sams Tender Beef Program®" (STB) were compared to twenty conventionally raise steers (C) in terms of different meat quality aspects. The STB program involves weaning at three months of age (instead of seven months o more), feedlot feeding for approximately 150 days (compared to 100 days conventional). Both groups were implanted with an anabolic growth promoter and fed a commercial feedlot diet. The animals were fed to the same carcass fat condition and were slaughtered at a commercial abattoir. Electrical stimulation (400 V for 60 seconds, at a frequency of 11.1 pulses per second and 2 A peak current) was applied a standard commercial procedure directly after exsanguination. The *M. longissimus thoracis et lumborum* (11th thoracic vertebra and extending caudally)(LT) and *M. semitendinosus* (eye of silverside)(ST) of both carcass sides were sampled for sensory evaluation, vacuum packed and aged for either 12 or 21 days *post mortem* at 4°C. Both LT and ST were processed into 30 mm steaks and prepared according to an oven-broiling method using direct radiant heat (AMSA, 1978). A 10-member panel of trained judge evaluated cooked samples (70°C internal endpoint temperature) of the two muscles for aroma intensity, juiciness (2 aspects) tenderness (3 aspects) and flavour intensity.

Discoloration of the loin after 1, 12 and 21 days vacuum-packed storage (0 –2 °C) was measured in terms of the development o the oxidised pigment metmyoglobin relative to reduced myoglobin plus oxymyoglobin using a Pye-Unicam 8700 spectrophotometer provided with a PU8700 diffuse reflectance accessory (Phillips, Jhb.). The method of Krzywicki (1979) was used to calculate the metmyoglobin percentage. The LT was cut into steaks, which were singly placed in Styrofoam trays, over wrapped with PVC and displayed at 4 °C for a period of 4 days in a Costan retail display cabinet (Airomatic, Midrand). Single samples were selected after each display period and triplicate measurements taken.

Results and discussion

The STB procedure (younger weaning age and prolonged feeding) had a significant effect ($P<0.05$) on tenderness related characteristics (first bite, overall tenderness, residual tissue and shear force resistance) of the LT and ST at both ageing periods (Figure 1 & 2). The effect of the STB procedure was less for the LT than for the ST muscle. The advantage of STB was emphasised by the fact that sensory tenderness scores tended to be higher for STB meat aged for 12 days compared to than Conventional meat aged for 21 days for both muscles, suggesting savings on post mortem ageing cost The longer ageing period tended to reduce the advantage of STB over C from 12% to 8% for sensory tenderness and from 21.4 N to 13.2 N for shear force resistance of the LT. This suggests that even greater effects could be achieved with STB at ageing periods shorter than 12 days. In contrast, the effect of STB on the ST muscle increased with longer ageing periods from 7.1% to 8.1% for sensory tenderness and from 9.5 N to 12.6 N for shear force resistance. When comparing the shear force values of the LT and ST between treatments, it is interesting to note that the STB ST was more tender than the Conventional LT at 12 days (10 Newton) and similar to the Conventional LT at 21 days (Figure 3). Sensory panel results did not show the same tendency indicating that other properties, such as juiciness and texture might have influenced the tenderness scores of each specific cut. Regarding other sensory attributes, flavour intensity (not showed) scored significantly ($P<0.05$) higher for STB compared to C at both ageing periods., although differences were very small (<0.2 units).

Although the STB treatment tended to discolour at a faster rate during retail display than C, neither treatment, (STB vs. C) nor ageing period (12 vs. 21 days) had a significant effect on colour shelf life, measured as metmyoglobin accumulation (Figure 4). Furthermore, both treatments had metmyoglobin levels of < 14% after 4 days, which is well below the threshold level of 35% where shopper discrimination will start to take place.

Conclusion

Both colour shelf life and eating quality results indicate that, besides the advantage in the feedlot, the benefit of STB probably lies in its potential to provide high eating quality at shorter *post mortem* ageing periods compared to the beef produced the conventional way. Consequently, a larger proportion of the carcass could probably be utilised by means of dry heat cooking methods (broiling, grilling), although differences in texture, appearance, juiciness and overall palatability of these traditional "roasts" (moist heat) on consumers' choice should be verified.

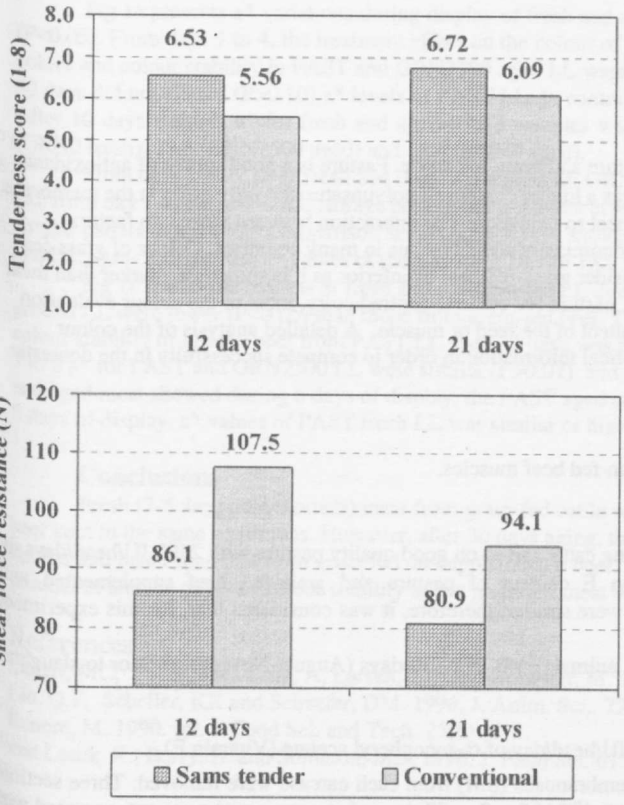

Figure 1: Comparison of sensory tenderness and shear force resistance between Sams Tender Beef and Conventional beef loins (LT) at two different ageing periods

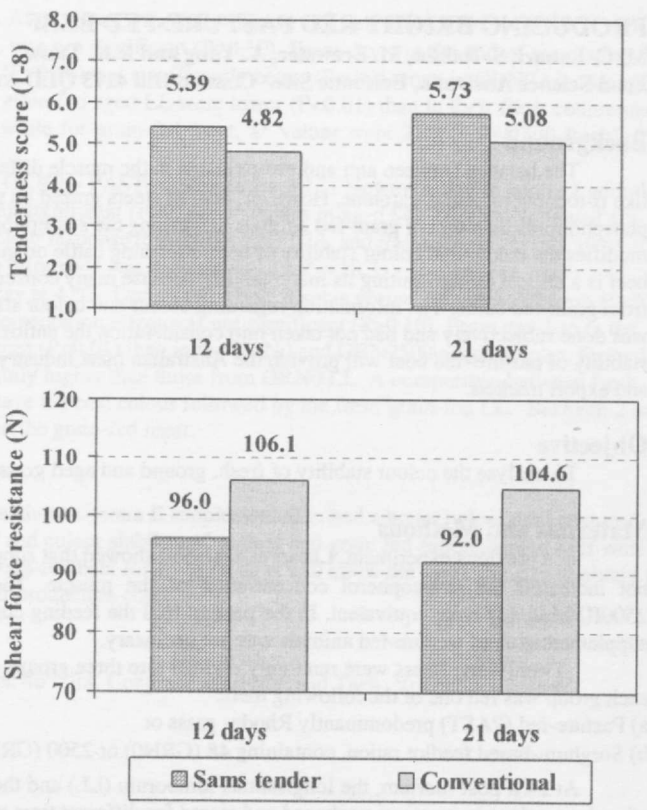

Figure 2: Comparison of sensory tenderness and shear force resistance between Sams Tender Beef and Conventional beef silversides (ST) at two different ageing periods

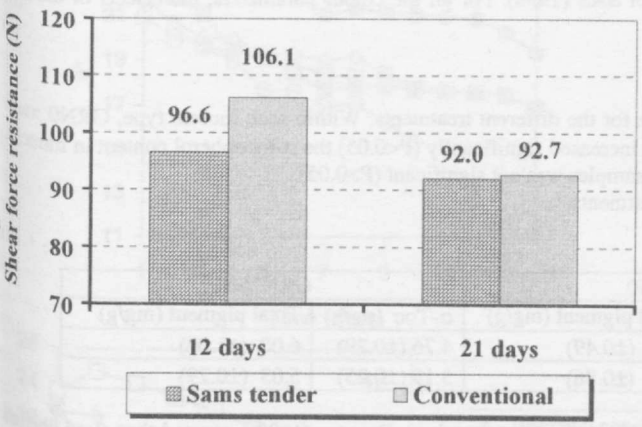

Figure 3: Comparison of shear force resistance between Sams Tender Beef silversides (ST) and Conventional beef loins (LT) at two different ageing periods

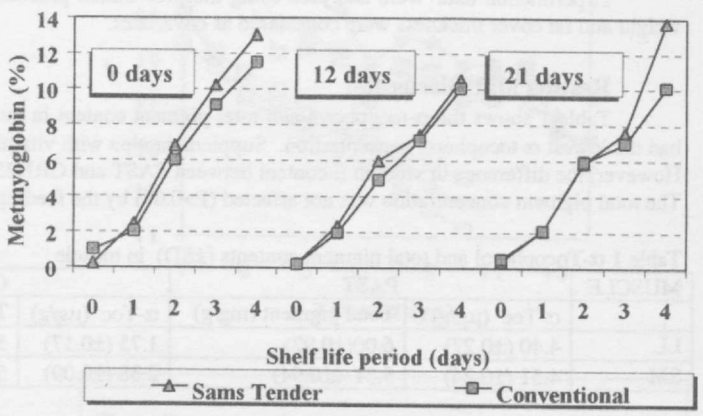

Figure 4: Metmyoglobin accumulation (discoloration) of loin steaks from Sams Tender and Conventional wholesale loins vacuum packed and aged for 0, 12 and 21 days.

References

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