Effect of electrical stimulation, age of the animal and extreme ageing on tenderness and water hoding capacity of beef loin muscles

ARC • LNR
Excellence in Research and Development

Michelle Hope-Jones[1], Phillip E. Strydom[1] & Ennet Moholisa[2]

[1] Animal Nutrition and Animal Products Institute: Agricultural Research Council of South Africa, Private Bag X2, Irene, 0062, South Africa.

[2] Microbial, Biochemical and Food Technology, Free State University, PO Box 339, Bloemfontein, 9300, South Africa

INTRODUCTION

- Animal age is one of many factors affecting meat quality in general, but tenderness in particular.
- Namibia exports vacuum-packed hind quarter cuts as Super (age groups with permanent incisors from 0-6) and Prime (age groups with permanent incisors >7) product lines.
- Two ageing regimes apply, at least14 days to South Africa and up to 3 months to Europe.
- Under this scenario:
  - What is the risk mixing of age groups within 1 quality grade?
  - Will electrical stimulation benefit cuts from older animals and/or the extended ageing regime?

OBJECTIVE

To determine the risk of variation in animal age on tenderness of beef loins exposed to extreme post mortem aging and electrical stimulation.

METHODS

- Seven age groups (based on permanent incisors, p.i.)/diet were used:
  - Pasture finished A (0 p.i.), AB (1 - 2 p.i.), B (4 p.i.), B (6 p.i.), C (8 p.i.).
  - Feedlot finished A (0 p.i.) and AB (1 - 2 p.i.).
- Six carcasses per age group electrically stimulated for 45 seconds (ES) (150V, 17Hz, 5ms pulse width) and 6 not (NES).
- M. longissimus lumborum (LL) samples vacuum-packed and aged for 14 days or 45 days.
- Warner Bratzler shear force (WBSF) and sensory analysis by a trained panel.

RESULTS

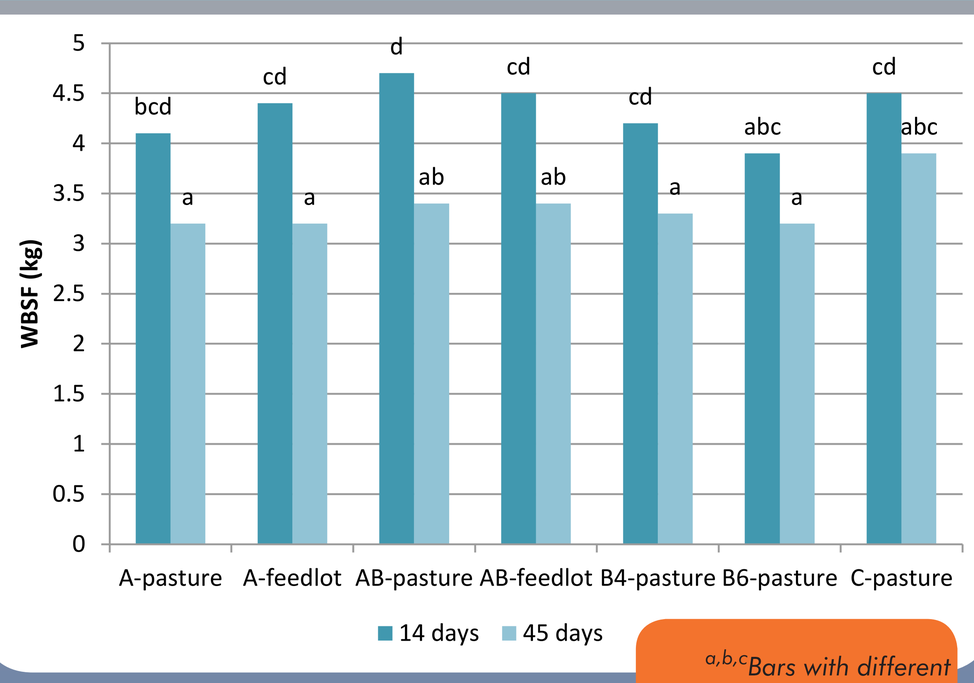
- Effect of age/diet scenario (Table 1):
  - C-age loins scored lower than all the other age groups P < 0.001).
  - WBSF showed the same trend (P = 0.061).
- Effect of electrical stimulation (Table 1):
  - Scored higher for sensory tenderness (P < 0.001) irrespective of age/diet or duration of post mortem aging.
- Effect of ageing (Table 1):
  - Improved both sensory tenderness and WBSF (P < 0.001).
- Interaction between aging and age/diet (Figure 1; P = 0.084):
  - AB-pasture carcasses responded to aging the best of all the groups (1.3kg improvement).
  - C-pasture group only improved by 0.6 kg after a further 30 days ageing.

Table 1: Effect of electrical stimulation, age/diet and post mortem ageing on tenderness (WBSF) and overall tenderness (sensory).

	WBSF (kg)	Sensory
Elec. stimulation:		
NES	4.0	5.4[a]
ES	3.7	5.7[b]
SEM	0.1210	0.1123
Age/diet:		
A-pasture	3.6	5.9[bc]
A-feedlot	3.8	6.1[c]
AB-pasture	4.0	5.6[bc]
AB-feedlot	4.0	6.0[bc]
B4-pasture	3.7	5.5[b]
B6-pasture	3.6	5.7[bc]
C-pasture	4.2	4.5[a]
SEM	0.2264	0.2100
Ageing:		
14 days	4.3[b]	5.5[a]
45 days	3.4[a]	5.7[b]
SEM	0.0490	0.0562

[a,b,c]Means in the same column and treatment category with different superscripts differ significantly (P<0.05).

Figure 1. The interaction between age/diet and ageing for WBSF.



[a,b,c]Bars with different superscripts differ significantly (P<0.05)

CONCLUSION

- The risk of grouping cuts of animals with 6 p.i. or less into 1 product category seems to be low based on shear force and sensory tenderness measurements of the loin muscle.
- Results should not be extrapolated to all cuts of the hind quarter (silverside, topside, thick flank) due to variation in connective tissue content and structure.
- Extended ageing beyond 14 days and electrical stimulation should further reduce the risk of experiencing a tough steak.