

HISTOLOGICAL AND PHYSICAL ATTRIBUTES OF MEAT OF NGUNI, BONSMARA AND ANGUS STEERS RAISED ON VELD

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Introduction

Most reports on meat quality, especially in Southern Africa, are based on established cattle breeds on cultivated pastures in the sourveld areas, in feedlots or with enhanced poor quality roughages (Strydom *et al.*, 2001). Ante-mortem and post-mortem conditions the animals and carcasses are subjected to, influence carcass cooling, the rate of glycolysis, early pH changes and, consequently, the process of transformation of muscle into meat. Although it is established that breed influences the properties and structure of muscle, meat physiology and quality (Andersen *et al.*, 2005), information on indigenous breeds of Southern Africa raised on natural pasture is largely unavailable. One indigenous breed which is adapted to local production conditions of the sub-tropics, tolerant to tick infestation and has potential to produce organic beef is the Nguni. Exotic breeds, for example the Angus, which have been developed under relatively benign conditions, fail to survive under veld conditions where the Nguni thrives. However, there is no information available on meat quality of Nguni cattle grazing on sweetveld without feed supplementation. The objective of this study was to compare meat quality of Nguni, Bonsmara and Angus steers when raised on sweetveld.

Materials and Methods

Fifteen 7-month old steers of each of Nguni, Bonsmara and Aberdeen Angus weaners were raised on sweetveld without any feed supplementation at the University of Fort Hare farm till slaughter at 18 months. The animals were transported to an abattoir 120 km from the farm and slaughtered 24 hours later. All carcasses were electrically stimulated. Meat quality analyses were done on the *M. longissimus thoracis et lumborum* (LL) sampled a 24 hours after slaughter. Drip loss and pH were determined 48 hours post-mortem. Colour was also determined after 48 hours using a colorimeter (Model CR200, Minolta, Japan) that directly transmits measured values of CIE system: Lightness L* and coordinates a* (redness) and b* (yellowness). Sarcomere length was measured using video image analysis (VIA; Kontron Germany). Warner Bratzler shear forces (SF) of meat samples were determined using Universal Instron apparatus. Myofibrillar fragment length (MFL) of meat samples was determined using a method described by Culler *et al.* (1978) and modified by Heinze and Bruggermann (1994). The effect of breed on histological and physical characteristics of meat was analyzed using GLM procedures of SAS (2000). The significance differences between least-square group means were compared using the PDIFF test of SAS (2000).

Results and Discussion

As shown in Table 1, the lightness (L* value) for Nguni meat was lower ($P < 0.05$) than that of the other two breeds. The L* value of meat is directly related to the ultimate pH (pHu) of the muscle (Hector *et al.*, 1992), with higher pHu being associated with dark cuts and vice versa. The darker Nguni meat scores could have been due to a lower glycolytic potential in Nguni steers due to their stress responsiveness as an adaptive measure to harsh conditions. The Nguni has been shown to release a lot of catecholamines, during the pre-slaughter period, causing the depletion of glycogen (O'Neill *et al.*, 2006). Lowered glycogen causes an increase in pHu which is not optimal for conversion of muscle into meat (Purchas *et al.*, 1999; O'Neill *et al.*, 2006). As shown in Table 1, the pHu (< 6.2) and L* values (> 33) were within the expected ranges (Diaz *et al.*, 2006) that would not result in dark firm dry (DFD) meat. There were no breed effects ($P > 0.05$) on drip loss, pHu, a*, b*, sarcomere length, SF and MFL.

Table 1: Least square means and standard errors of means (in parenthesis) of physical and histological attributes of *Longissimus thoracis et lumborum* muscle of Nguni, Bonsmara and Angus steers.

	Breed		
	Nguni	Bonsmara	Angus
N	15	14	10
Drip loss (%)	1.8 (0.12)	1.6 (0.13)	1.7 (0.15)
pHu	5.7 (0.02)	5.7 (0.03)	5.7 (0.03)
Lightness (L*)	36.5 (0.50) ^a	38.6 (0.52) ^b	39.9 (0.62) ^b
Redness (a*)	15.8 (0.38)	16.0 (0.39)	16.6 (0.47)
Yellowness (b*)	6.5 (0.20)	6.7 (0.21)	7.1 (0.25)
Colour saturation	17.1 (0.42)	17.4 (0.43)	18.1 (0.51)
Sarcomere length (µm)	1.6 (0.02)	1.7 (0.03)	1.6 (0.03)
Warner Bratzler value (Kg)	3.7 (0.24)	4.1 (0.25)	3.7 (0.30)
Myofibrillar fragment length (µm)	23.5 (0.58)	23.6 (0.60)	23.5 (0.72)

^{a,b}Means in the same row with different superscripts are significantly different at $P < 0.05$.

Conclusions

Besides L*, there were no breed effects on meat quality traits. Therefore, besides being a smaller and multipurpose breed the Nguni can compete favourably with established breeds in terms of meat quality. There is need, however, to perform more meat quality assessments such as fatty acid profiles and sensory evaluations.

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