THE DRAKENSBERGER:

Its capacity as feedlot steer and its potential to yield high quality beef

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Introduction

Cattle indigenous to Africa are often misnamed as *Bos indicus*, based on their phenotype (conformation and hump), while it has been shown that most of these breeds are more related to *Bos taurus* (European cattle) than *Bos indicus*. Like, *Bos indicus* cattle, the breeds are well adapted to harsh environments and are collectively known as Sanga or Sanga *(Bos taurus africanus)*. Within this group of cattle breeds the Drakensberger is believed to be a commercially improved Sanga.

In countries like Australia, the grading system automatically discriminates against humped animals on the basis of the incorrect assumption that such animals are indicus derived. However, various studies have shown that Sanga or Sanga derived cattle may well adapt to feedlot conditions and produce meat of comparable quality to that of Continental and British breeds. To our knowledge there is very little information available describing and comparing the growth performance, carcass yield and meat quality of the Drakensberger as Sanga derived breed and this paper attempts to inform the reader of these qualities in comparison with other Sanga breeds and an indicus breed according to a study done at ARC Irene. Grainfed Drakensberger, Bonsmara, Nguni, Tuli and Brahman steers were compared for feedlot performance, yield and meat quality.

Growth performance

Table 1: Breed comparisons for growth performance and carcass yield

	BO	BR	DR	NG	Tuli
Average days on feed	132	132	132	132	132
ADG (kg/day)	1.7	1.5	1.8	1.5	1.7
FCR (kg/kg)	5.96	5.41	5.69	5.95	5.42
Final weight (kg)	467	413	454	391	418
Cold carcass weight (kg)	270	235	265	227	241
Dressing (%)	57.8	56.8	58.3	58.0	57.5

Breeds: Bonsmara (BO), Nguni (NG), Drakensberger (DR), Tuli and Brahman (BR)

The Drakensberger and Bonsmara tend to produce heavier carcasses within the range of 270 kg regarded as the average standard according to the SA Feedlot Association's statistics. On these grounds, both these breeds would be suitable for grain feeding under South African feedlot conditions. The dressing % of the Brahman was slightly lower than most other breeds including the Drakensberger, but this could be attributed to the lower carcass fatness (see average fat thickness of rump and loin; Table 2) of the Brahman. The latter may also explain the slight advantage that the Brahman had in feed conversion ratio, although all FCR values were in an acceptable range.

Yield

Table 2: Breed comparisons for carcass measurements and yield parameters

	BO	BR	DR	NG	Tuli
P8 fat thickness (mm)	7.5	6.3	7.6	8.1	7.5
Rib fat thickness (mm)	7.3	4.0	8.4	7.2	6.7
Round meat yield (%)	72.9	72.1	72.5	71.8	73.0
Trimmed fat (%)	10.8	10.9	11.3	12.0	10.5
Bone yield (%)	16.4	17.1	16.2	16.2	16.5
Kidney and channel fat (%)	3.30	2.53	3.57	3.23	3.47
Marbling (%)	1.43	1.46	1.73	1.53	1.52

Breeds: Bonsmara (BO), Nguni (NG), Drakensberger (DR), Tuli and Brahman (BR)

All the cuts of the round that include the hind shin, rump, silverside, knuckle (thick flank) and topside, were seperated from the bone and trimmed of excess fat as an indicator of lean yield. On a proportional basis (%), only small differences in meat yield were evident with the Nguni showing the lowest yield. Of course heavier carcasses would have yielded higher weights than smaller carcasses. Both the Drakensberger and Nguni had slightly higher fat trim due to higher average fat thickness measurements. The Brahman had proportionally higher bone yields than other breeds due to less aggressive growth and probably lower muscularity. The tendency towards higher kidney and channel fat of the Drakensberger may be a concern since this fat depot is regarded as waste, although in this trial it was also probably a function of general fatness. Marbling in our country has no function since the levels reached under our standard commercial feeding regime is not sufficient to show any effect on palatability.

Meat Quality

Shear force measures the resistance in kg when shearing through a standard specimen of cooked meat using a special shearing device. Higher values indicate less tender meat. Previous studies have shown that threshold values of 4.6 kg and 3.9 kg for "retail" and "food service" beef exist for cuts that were prepared according to the same specifications as those used by ARC-Irene Sensory laboratory. Ultimately, one needs at least a shear force of 4.6 kg to have a steak rated at least "slightly tender" by consumers and lower than 3.9 kg to be acceptable in the food service sector. In another study consumers were able to differentiate between three categories of tenderness, viz. 2.3 to 3.6 kg, 4.1 to 5.4 kg and 5.9 to 7.2 kg. Ninety four percent of the consumers preferred the first category and was willing to pay a premium for improved tenderness. According to these benchmarks none of the breeds were suitable for retail or food service sectors if loin steaks were sold unaged (or aging limited to 2 days). For the second example of differentiation, Brahman steaks sorted into the poorest category and those of the other breeds in the middle category. When aged for 21 days steaks of all breeds except the Brahman were suitable for the food service sector and the steaks of the Drakensberger, Bonsmara and Nguni sorted into the preferred category. Since tenderisation through aging of meat is mostly the result of the actions of proteolytic enzymes (in particular the calcium dependent proteolytic enzymes or CDPs), on the muscle fibre destabilisation (breakdown), various biochemical and histological tests can confirm tenderness results. Generally speaking the CDP system consists of calpain enzymes responsible for breaking down muscle structure and their inhibitor, calpastatin, which inhibits this process. Interestingly, these systems are involved in muscle protein turnover in live animals and then serve as "tenderisers" after the animal has been slaughtered. Histologically (microscopic study of cell tissue), the length of the myofibre fragment (or the contracting unit of the muscle) will indicate the progress in the aging process and could relate to tenderness. Shorter fragments indicate more or faster breakdown of the myofibrillar structure (Figure 1).

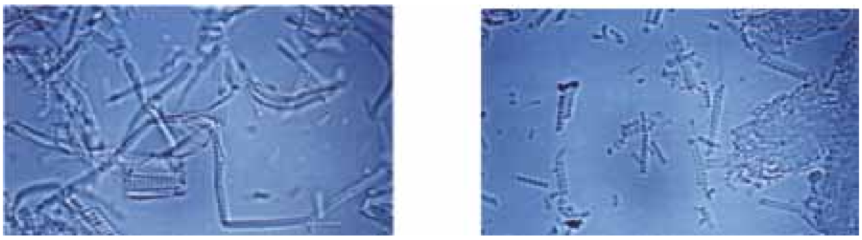

Figure 1: Change in fragment length from 2 (left) to 21 days (right) post mortem.

Myofibrillar fragment length in Table 3 shows that Drakensberger (37.7 micron) had an advantage over the Brahman (45.7 micron) even after 2 days aging. Although most of this advantage was cancelled out by prolonged aging the Drakensberger still had shorter MFL's and probably benefitted from early advanced aging. Further confirmation that the Drakensberger steaks should age well, was the favourable enzyme activity ratios which showed a lower inhibitor : enzyme activity ratio compared with the Brahman.

Connective tissue properties do not play a major role in tenderness of the loin muscle because loin muscle is a relative low connective tissue muscle type compared with e.g. the shin or topside. Nevertheless, the proportion (%) of soluble collagen (the portion that is not heat stable) was higher in most of the breeds compared with that of the Brahman. This may have added to the advantage in tenderness of the other breeds, including the Drakensberger.

Conclusion

Any research results should always be approached with caution as it only represents a sample of a larger population. Nevertheless, based on the results from this project and the benchmarks used for feedlot performance and meat quality, the Drakensberger is an indigenous breed that should perform well in the South African beef industry. The results confirm that it is capable of performing well under feedlot conditions and could produce high quality beef in addition to its inherent ability to thrive under extensive conditions.

Table 3: Breed comparisons for shear force tenderness, muscle biochemistry and muscle histology (loin muscle)

Trait	Breeds				
	BO	BR	DR	NG	Tuli
Shear force (kg)					
2 days aging	5.07	6.57	5.28	5.13	5.84
21 days aging	3.41	4.64	3.30	3.49	3.90
2 vs. 21 days	1.66	1.93	1.98	1.64	1.94
Myofibrillar fragment length (μm):					
2 days aging	39.5	45.7	37.7	38.3	43.8
21 days aging	25.6	28.0	25.8	25.4	26.2
2 vs. 21 days	13.9	17.7	12.0	12.8	17.7
Proteolytic enzyme activity:					
Calpastatin: μ-calpain ratio	4.57	7.73	5.30	5.20	6.00
Connective tissue properties					
Total collagen (mg/g)	3.95	3.83	4.16	4.13	4.06
Soluble collagen (%)	20.9	19.7	22.6	22.6	23.4

[a]Breeds: Bonsmara (BO), Nguni (NG), Drakensberger (DR), Tuli and Brahman (BR)