PE9.07 Effect of Acacia karroo on nutritional composition and cholesterol levels of beef 35.00

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Abstract The objective of the study was to determine the nutritional composition and cholesterol levels of meat from Nguni steers supplemented with Acacia karroo leaf-meal. Thirty 19-month old steers were randomly assigned to A. karroo leaf-meal (AK), sunflower cake (SF) and the control (CN) diets for 60 days. The m. longissimus thoracis et lumborum was sampled for analysis. Steers supplemented with AK (22.4 ± 0.08 %) and SF (22.5 ± 0.08 %) had higher (P < 0.05) protein content than those on CN (20.2 ± 0.08 %) diet. Highest fat content (1.2 ± 0.11 %) of meat aged for two days were recorded in steers given SF (P < 0.05). Diet had no (P > 0.05) effect on moisture, ash and cholesterol content of meat from Nguni steers. It was concluded that the AK diet increased the protein content of Nguni beef.

I. INTRODUCTION

Recently, consumers have increased preference for naturally/organically produced animal products, which do not adversely affect their health (Muchenje, Dzama, Chimonyo, Strydom, Hugo & Raats, 2009). Utilisation of appropriate cattle genotypes with proper dietary regime could produce high-quality meat that meets customers' expectations (FAO, 2007). In South Africa, the Nguni breed produces meat quality comparable to exotic breeds under rangeland conditions (Muchenje, Dzama, Chimonyo, Raats, & Strydom, 2008a; Strydom, 2008). One major constraint of rangeland-based finishing systems in the semi-arid areas is, however, the limited protein supply (less than 50 g/kg DM) in the dry season (du Plessis and Hoffman, 2004), which results in low carcass weights and have adverse affects on meat quality (Muchenje et al., 2008a).

Supplementing beef cattle on rangelands with locally available protein sources can improve meat composition (French et al., 2001). In Southern Africa, one such potential protein supplement is the indigenous Acacia species, particularly A. karroo, which is rich in protein and minerals, widespread and abundantly available throughout the year (Mokoboki, Ndlovu, Ngambi, Malatje, & Nikolova, 2005). The effects of feeding A. karroo on meat composition of cattle raised on natural pasture have, however, not been established. The objective of the current study was, therefore, to determine the nutritional composition and cholesterol levels of meat from Nguni steers supplemented with Acacia karroo leaf-meal.

II. MATERIAL AND METHODS

The trial study was conducted at the University of Fort Hare farm, Alice, South Africa. Thirty Nguni steers were rotationally grazed on natural pasture at a stocking rate of 5 ha/LU from April 2007 to March 2008. The steers were seven months old at the beginning of the trial. In April 2008, at 19 months of age, the steers (241.5 ± 14.62 kg) were then randomly assigned to three dietary treatments: A. karroo leaf meal (AK), sunflower cake (SF) and the control diet with no supplement (CN), until June 2008. Each treatment group was made up of 10 steers.

In addition to natural pasture, steers on the AK and SF diets were offered 1.5 kg and 650 g of feed, respectively, to supply 150 g of protein per day. Veld hay (300 g) was added to AK diet A. karroo foliage to improve palatability. Steers on the same treatment were kept in one paddock. The steers on the supplementary diets were allowed 21 days to adapt to their respective diets prior to the 60-day supplementary feeding trial. These steers were trained for 14 days during the adaptation period to feed from individual troughs. The feed was offered daily at 0830 h. All the steers were released daily for grazing at 1000 h and kraaled at 1730 h throughout the trial period. Residues for each steer on the supplementary diet were weighed at 1015 h using a digital scale (Terooka Seiko Co. Ltd, Japan). Clean tap water was freely accessible to the experimental animals. The steers were dipped once using a commercial acaricide to control ticks.

Dietary components were assessed for dry matter (DM), crude protein (CP) and crude fat using the Association of Official Agricultural Chemists (AOAC,

2003) procedures. Neutral detergent fibre (NDF) and acid detergent fibre (ADF) were determined according to Van Soest Robertson, & Lewis (1991) and condensed tannins (CT) assays were done using the butanol-HCl method (Bate-Smith, 1981). The in vitro DM and NDF disappearance were determined using the Daisy ANKOM system (Goering & Van Soest, 1970; Van Soest & Robertson, 1985). Weights of the steers were measured every fortnight using a heavy duty scale (Cattleway, Johannesburg, South Africa).

Average daily gain (ADG) (g/day) between the initial weight and slaughter weight was calculated for each steer. Body condition scores (BCS) at slaughter were visually appraised by a veterinarian using a 5-point scale (1-very thin and 5-very fat). Twenty four hours prior to slaughter, the 21 month old steers were weighed and trucked to the slaughtering plant at the East London Abattoir. At the abattoir, the steers were deprived of feed overnight, but water was always available. The m. longissimus thoracis et lumborum (LTL) of the right side was sampled, a day after slaughter, from the 10th rib in the direction of the rump and a 100 mm thick piece of the posterior side of the right LTL was taken and vacuum-packaged at 0–3 °C pending analysis. A 50 g sample of the LTL was ground and freeze-dried for the determination of protein, fat, moisture and ash contents (AOAC, 2003).

The extraction and quantification of cholesterol were carried out by the method of Al-Hasani, Hlavac and Carpenter (1993), with modifications (Rowe, Macedo, Visentainer, Souza, & Matsushita, 1999). Cholesterol identification was made by comparing the relative retention time of peaks from samples with standards from SIGMA (USA). The effect of time of sampling on supplementary feed intake and effect of diet on ADG meat quality attributes were analysed using Generalised Linear Model procedure of SAS (2003). Pair-wise comparisons of the least square means were performed using the PDIFF procedure of SAS (2003).

III. RESULTS

Sunflower cake had the highest CP content (360 g/kg) followed by A. karroo (150 g/kg). The CP content of the natural pasture declined from 39.6 g/kg in March to 31.9 g/kg in May. Crude fat content was highest in sunflower cake (2.5 g/kg), followed by natural pasture (2.2 g/kg) and A. karroo (2.0 g/kg). The ADF (290 g/kg) and condensed tannins (7.4 g/kg) contents of A. karoo were higher than those of sunflower cake (180 and 0.06 g/kg). A. karroo (580 and 440 g/kg) had higher in vitro DM and NDF disappearances after 48 hours were than for sunflower cake (440 and 410 g/kg) and natural pasture (550 and 540 g/kg). Nguni steers on the SF diet consumed all their daily feed allocation. The AK intake increased ($P<0.05$) from week 1 (0. 8 kg) to week 4 (1.48 kg) and remained invariable until week 8. Steers that were given the SF diet had the highest ADG (380.0 ± 33.09 g/kg) and slaughter weights (294.5 ± 3.65 kg) followed by those on the AK with daily gain of 305.4 0 ± 33.09 g/kg and slaughter weights of 280.1 ± 3.65 kg. Steers on the CN diet had the lowest daily gain (270.3 0 ± 33.09 g/kg) and lowest slaughter weight (259.4 ± 3.65 kg. Steers supplemented with the AK and SF diets had higher ($P < 0.05$) meat protein content than those on the CN diet. The highest fat content was recorded in steers that received SF diet ($P < 0.05$; Table 1). Diet had no ($P > 0.05$) effect on moisture, ash and cholesterol content of meat from Nguni steers (Table 1).

IV. DISCUSSION

The observation that meat from steers fed on supplementary diets had higher protein content than those on CN diet can be ascribed to high dietary CP intake (Schor, Cossu, Picallo, Ferrer, Nao´n, Colombatto, 2008). The higher fat content observed in meat of steers supplemented with the SF could be due to higher dietary fat intake. Similarly, Santos-Silva Mendes, & Bessa (2002) found that concentrate supplemented and feedlot animals had higher fat content than pasture-fed ones. The finding that diet had no substantial effects on meat cholesterol agrees with French et al. (2001), who also observed that beef coming from steers finished on pasture has lower fat and cholesterol concentrations than that from concentrate fed ones. The observed fat and cholesterol values were consistent with earlier reports by Muchenje, Hugo, Dzama, Chimonyo Raats, & Strydom (2008b) under natural pastures. High levels of fat and cholesterol in foods have been directly associated with heart diseases (Schor et al., 2008).

V. CONCLUSIONS

Supplementing natural pasture with A. karroo produced beef of comparable nutritional composition to natural pasture but with higher protein content. Acknowledgements The authors are grateful to the

Kellogg Foundation, National Research Foundation of South Africa and Cannon Collins Trust, Southern Africa for their financial support. The meat samples were analysed at the Agricultural Research Council (ARC), Irene, South Africa.

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