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Impacts of four distinctive basal weight control plans on the composition of completing Borana bulls

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Abstract

Twenty four Borana bulls (average weight 218 ± 6.3 kg) were randomly assigned to 4 finishing diets to study the effects of basal diets on carcass composition. Diets were: R1 (teff straw 30%, local hay 10%, haricot bean straw 10%, molasses 20%, corn grain 20% and haricot bean grain 10%), R2 (teff straw 10%, haricot bean straw 20%, maize stover 10%, molasses 15%, corn grain 25%, noug cake 10% and linseed cake 10%), R3 (teff straw 10%, local hay 20%, molasses 25%, wheat bran 15% and wheat middling 30%) and R4 (teff straw 20%, molasses 30%, wheat bran 20% and wheat middling 30%). Animals were individually fed for 90 days at the recommended level of 3% of body weight. Results showed that, compared to other diets, R1 resulted in a significantly lower hot carcass weight (98.2 ± 18.4, vs 146.8 ± 6.7, 135.2 ± 8.1 and 135.2 ± 3.2, for R2, R3 and R4, respectively). Similar trends were observed for kidney fat, hump, scrotal fat weights and rib eye area. There was no significant difference in heart and omental and mesenteric fat weights, and back fat thickness among rations. However, R2 resulted in the highest weights. Although slight variations were observed in bone, fat and lean meat weight for different primal cuts, the difference among rations was not significant except for loin muscle, rack muscle and breast and shank muscle weights. R1 significantly (P<0.05) differed from other groups. R2 resulted in primal cuts with higher values. It was followed by R4, R3. R1 had the lowest values. Total feed cost did not differ among rations. However, it was highest for R2 and lowest for R3. R4 and R1 fall somewhere in between. Therefore, Borana bulls can be finished on any of the R2, R3 and R4 rations wherever they are available. Alternatively, R1 can be used anywhere else where other rations are scarce. Further studies are required on the effects of age and feeding duration on carcass characteristics of Borana bulls.

Keywords: Basal diet, borana bulls, carcass composition, primal cuts.

INTRODUCTION

In Sub-saran Africa matured natural grasses and crop residues are the most abundant cattle feed resources (Michael et al., 2001; Soller et al., 1986; Goe, 1987). Ethiopia is located in this region and it uses different roughage diets widely as animal feed. Diets based on fibrous feeds are generally of poor quality when they are offered alone. In the other hand, ruminants are good converters of poor quality roughages provided that the ration is adequately supplemented with required nutriaents. Research results showed that it is possible to use roughages as finishing diets as long as appropriate supplementation and/or treatments are applied (O'Donovan and Gebrewold, 1983).

Today's finishing rations can contain as much as 75 to 95% of concentrate feed and up to 90% of the dietary energy comes from grains. However, feeding trials conducted in tropics indicated that crop residues can satisfactorily constitute up to 50% of finishing cattle rations (O'Donovan and Gebrewold, 1983). Indeed, including roughages in finishing rations is very helpful in reducing digestive disorders and in maintaining healthy digestive tract functions.

O'Donovan and Gebrewold (1983) evaluated different maize stalk based diets at Awassa. Their results indicated that rations containing 50% of maize stalk and cobs supported an average daily gain of 0.84 kg. However, due to the shortage in this roughage and the lack of economical analysis, it was not possible to develop different options of rations, which can be used by different fatteners under different production systems.

Table 1. Composition (%) of the different rations.

Item	R 1	R 2	R 3	R 4
Teff straw	30	10	10	20
Local hay	10	0	20	0
Maize stover	0	10	0	0
Haricot bean straw	10	20	0	0
Noug. Cake	0	10	0	0
Linseed cake	0	10	0	0
Corn grain	20	25	0	0
H. bean grain	10	0	0	0
Wheat Bran	0	0	15	20
Wheat middling	0	0	30	30
Molasses	20	15	25	30

Moreover, some of the ingredients used in ration formulation were not practically available at the farm level. Thus, there is a need to develop different finishing rations for Borana bulls based on locally available feed resources. It is within this context that we were conducting the present work which aims at comparing the effects of different finishing rations, formulated based on different low quality roughage, on the characteristics and the composition of the carcasses of Borana bulls with the attempt to develop different finishing rations for beef producers in the region. The objective of our study was therefore to compare four different basal diets based formulated rations on the carcass composition of finishing Borana bulls.

MATERIALS AND METHODS

Animals

Twenty four growing Borana (4 years old, average weight 218 ± 6.3) were used for the experiment. Animals were purchased from the local market of Borana zone. They were kept in quarantine for 3 weeks to receive necessary medical treatments. After drenching and spraying for internal and external parasites, animals were randomly assigned to 4 diets based on their body weight using completely randomized design and 6 animals were used on each diet through out experimental period.

Rations and feeding

Four different finishing rations were formulated based on different locally available feed resources. Table 1 gives the composition of the different rations.

All experimental animals were individually fed their corresponding rations for 21 days of adaptation followed by a 90 days experimental period. Each animal was offered daily 3% of its average live weight of dry matter of the corresponding rations.

Carcass evaluation

After the completion of the trial, 3 bulls were randomly selected from each treatment to be slaughtered for carcass evaluation at the ATARC animal slaughter house. The bulls were fasted for 18 h and weighed before slaughtered. Kidney, scrotal, heart, omental and mesenteric fat and hump weights were recorded using sensitive balance. Hot carcasses were weighed and kept in cool house for 24 h for chilling at -2^{o}C. Chilled carcasses were separated into five primal cuts namely, leg, lion, rack, shoulder, neck, breast and shank. After weighing, each primal cut was dissected into lean meat, bone and subcutaneous fat. Bone, meat and fat weights were recorded. Rib eye area and fat thickness were measured at 12th rib. Rib eye area was measured using calibrated water proof paper and fat thickness using a ruler.

Statistical analysis

Data was analyzed using general linear model (GLM) of Statistical Analysis System (SAS 1999- 2000). The estimated least squares means were separated by the Duncan's Multiple Range Test at P< 0.05. Since labor cost was similar for all groups, only total feed cost was calculated and compared between rations.

RESULTS AND DISCUSSIONS

Dietary effects on carcass components

The carcass composition of Borana bulls fed the different rations is given in Table 2. Compared to other diets, R1 resulted in a significantly (P<0.05) lower hot carcass weight (98.2 vs 146.8, 135.2 and 135.2 kg for R1, R2, R3 and R4, respectively). Although R2 resulted in the highest hot carcass weight, it did not differ, however from rations R3 and R4. This could be attributed to the difference in the composition of the feed included in ration 2 which may have contributed to the increase in feed intake as observed during experimental period. Similar trends were observed for heart, kidney, omental and mesenteric fat weights and back fat thickness. However, rib eye area, hump and scrotal fat weight differed between rations. Animals on ration 4 had the best performances. This is similar to the findings of Barton (1997) which indicate significant difference in fat variables among bulls fed different feeds.

Table 2. Least square mean of carcass yield traits and carcass composition for Borana growing bulls.

Traits	Ration			
	R_1	R_2	R_3	R_4
Hot carcass weight (kg)	98.2 ± 18.4^{b}	146.8 ± 6.7^{a}	135.2 ± 8.1^{a}	135.2 ± 3.2^{a}
Heart fat (kg)	0.3 ± 0.1^{a}	0.7 ± 0.2^{a}	0.5 ± 0.2^{a}	0.6 ± 0.1^{a}
Kidney fat (Kg)	1.6 ± 0.2^{bb}	3.5 ± 0.7^{a}	1.6 ± 0.3^{b}	2.9 ± 0.7^{ab}
Scrotal fat (kg)	1.1 ± 0.3^{b}	1.9 ± 0.3^{ab}	1.5 ± 0.1^{ab}	2.0 ± 0.4^{a}
Omental & mesenteric fat (kg)	2.8 ± 1.0^{a}	3.9 ± 0.7^{a}	3.5 ± 0.7^{a}	3.7 ± 0.9^{a}
Hump (kg)	1.9 ± 0.6^{b}	3.5 ± 0.7^{a}	3.1 ± 0.2^{ab}	4.6 ± 0.6^{a}
Back fat thickness(mm)	3.3 ± 1.9^{ba}	6.3 ± 1.2^{a}	5.3 ± 1.7^{a}	5.0 ± 2.1^{a}
Rib eye area (mm^2)	155.7 ± 6.4^{b}	234.0 ± 32.3^{a}	265.0 ± 22.5^{a}	216.3 ± 11.5^{ab}

Means within a row with different superscript letters differ at P<0.05.

Table 3. Least squares means of carcass component yields (primal cuts) of Borana bulls fed different rations.

Leg (Kg)	Carcass part	R1	R2	R3	R4
	Bone	3.7 ± 0.1^{b}	5.4 ± 0.5^{a}	4.9 ± 1.0^{ab}	4.1 ± 0.4^{ab}
	Meat	13.9 ± 2.9^{a}	18.3 ± 1.4^{a}	17.1 ± 1.2^{a}	16.5 ± 0.6^{a}
	Fat	$1.5^{b} \pm 0.5^{b}$	2.6 ± 0.2^{a}	1.9 ± 0.2^{ab}	2.1 ± 0.2^{ab}
Loin (Kg)	Bone	1.0 ± 0.3^{ba}	1.1 ± 0.2^{a}	1.1 ± 0.4^{a}	1.1 ± 0.1^{a}
	Meat	2.7 ± 1.0^{b}	4.0 ± 0.1^{ab}	4.8 ± 0.8^{a}	3.8 ± 0.4^{ab}
	Fat	0.6 ± 0.3^{a}	1.2 ± 0.1^{a}	0.9 ± 0.2^{a}	0.9 ± 0.3^{a}
Rack (Kg)	Bone	2.1 ± 0.4^{a}	2.9 ± 0.4^{a}	2.1 ± 0.1^{a}	2.2 ± 0.5^{a}
	Meat	3.8 ± 0.9^{b}	6.7 ± 0.9^{a}	6.1 ± 0.3^{ab}	5.2 ± 0.6^{ab}
	Fat	0.8 ± 0.1^{a}	1.3 ± 0.3^{a}	0.7 ± 0.4^{a}	1.6 ± 0.3^{a}
Breast & Shank (kg)	Bone	2.0 ± 0.1^{a}	2.2 ± 0.2^{a}	1.9 ± 0.2^{a}	2.0 ± 0.1^{a}
	Meat	3.0 ± 0.7^{b}	5.1 ± 0.1^{a}	5.5 ± 0.7^{a}	4.5 ± 0.5^{a}
	Fat	0.9 ± 0.3^{a}	1.4 ± 0.2^{a}	1.5 ± 0.3^{a}	1.2 ± 0.3^{a}
Shoulder & neck (Kg)	Bone	4.1 ± 0.4^{a}	4.1 ± 0.7^{a}	3.2 ± 0.7^{a}	4.3 ± 0.4^{a}
	Meat	10.2 ± 1.9^{a}	14.2 ± 1.9^{a}	14.3 ± 1.2^{a}	14.3 ± 0.7^{a}
	Fat	1.6 ± 0.6^{a}	2.0 ± 0.1^{a}	2.9 ± 1.1^{a}	2.4 ± 0.7^{a}

Means within the row with different subscript letter differ at P<0.05.

There was no significant difference among rations in heart and omental fat weights and back fat thickness of Borana bulls. However, heart fat weight was highest for ration R2, followed by rations R4, R3 and R1. Back fat thickness was highest for rations R2 and lowest for R1. Kidney fat weight was highest for R2, which did not differ from R4. R1 and R3 had significantly lower kidney fat weights. Scrotal fat weight was lowest for R1 and differed significantly only from R4. Rib eye area was highest for R3 and lowest for R1.

Dietary effects on carcass primal cuts

Although slight variations were observed among rations for bone weight, there was no significant difference for other different primal cuts of Borana bulls. These results were similar to the report of Michael et al. (2001) in which they indicate that there are no significant different among the bone proportion of oxen fattened on different feeding management. Leg fat and lean meat weights for different primal cuts (legs, loin, rack, breast and shank and, shoulder and neck) did not differ among rations (Table 3). This result is similar to that reported by Tesfaye and Tesfa (2006), which indicate that there was no significant difference among beef quality parameters of Kereyu bulls finished on the similar rations for 90 days.

Primal cuts of bulls finished on R2 had higher contents of bone, meat and fat. The lowest contents were observed for R1, whereas R4 and R3 had similar intermediary contents. There was a general trend that as the proportion of crop residues or roughages decreases in the diet, the fat accumulation of the cuts increases, except for the shoulder and neck cut. Similar results were reported by Markham et al. (2002) in which they indicated that steers fed on crop residue as a roughage had less fat accumulation than those fed on improved forage. Similar findings confirm the fact that the type of feeds offered to animals can affect fat accumulation (Wood et al., 1999; Scollan et al., 2006). Also in agreement to these results Michael et al. (2001) indicate that the animals kept on more roughage produce less fat whereas those animals kept on medium and higher level of wheat bran produce carcass with more fat.

Bulls receiving ration 2 had the highest bone weight, whereas those fed R1 had the lowest weights for all primal cuts. Rations R4, R3 resulted in intermediary weighths. Similar trends were observed for lean meat and fat across rations. This indicates that animals finished on rations containing more crop residue (roughage) accumulated less fat especially that trimmed from leg primal cut. The same trend is also observed for the fat weight of other primal cuts. This is similar to the finding of Markham et al. (2002) which indicate that steers fed on crop residue as roughage had less fat accumulation than steers fed on improved forage as roughage.

Conclusion

Feeding rations were not found to significantly affect carcass characteristics of Borana bulls. However, among the studied rations, R2 resulted in better carcass traits and primal cuts, whereas R1 gave lower quality carcassses and cuts. Moreover, there was no significant difference in total feed cost among the rations. Therefore, any of the R2, R3 and R4 can be used for finishing Borana bulls wherever they are available. Otherwise, R1can be used. Further study on the effects of age and fattening period on carcass characteristics of Borana bulls is required.

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REFERENCES

Barton RA (1997). Comparison of the carcass characteristics of steers of different breeds and pre-weaning environments slaughtered at 30 months of age. New Zealand. J. Agric. Res. 40:57-68.

Goe MR (1987). Animal traction on smallholder farms in the Ethiopian highlands. PHD dissertation. Department of Animal Science, Cornell University of Ithaca, New York.

Markham CE, Krehbiel CR, Gill DR, Lalman DL, McBeth LJ, Ball RL (2002). Effect of fiber source on feedlot performance and carcass characteristics of yearling steers. Animal Science Research reports, Oklahoma Agricultural Experiment station.

Michael TW, Osuji PO, Yimengnuhal A, Yami A (2001). Effect of wheat bran supplementation on feed intake, body weight change and retained energy in the carcass of Ethiopian Zebu (bos indicus) oxen fed teff straw (eragrostis tef) as basal diet. In proceedings of 9th national conference of Ethiopian Society of Animal Production held 30-31 August, 2001, Addis Ababa, Ethiopia. pp. 111-124.

Michael TW, Osuji PO, Yimengnuhal A (2001). Effect of wheat bran supplementation at graded levels on changes in physical body composition in tef straw (eragrostis tef) fed zebu (bos indicus) oxen of the Ethiopian highlands. In proceedings of 9th national conference of Ethiopian Society of Animal Production held 30-31 August, 2001, Addis Ababa, Ethiopia. pp. 111-124.

O'Donovan, Gebrewold (1983). Fattening zebu and crossbred cattle on maize residues and concentrates. Tropical animal production, 8:1-6.

SAS (Statistical Analysis System) (1996). Cary .NC. SAS Institute Inc.

Scollan ND, Hocqute Jean-francois, Nuernberg Karin, Dannenberger Dirk, Richardson I, Moconey Aidan (2006). Innovation in beef production systems that enhance the nutritional and health value of beef lipids and their relation ship with meat quality. J. Meat Sci. 74:17-33.

Soller H, Reed ID, Butterworth MH (1986). Intake and utilization of feed by work oxen. ILCA news letter Vol. 5, Addis Ababa, Ethiopia.

Tesfaye L, Tesfa G (2006). Carcass quality of Kereyu bulls on different finishing rations. In proceedings of 14th national conference of Ethiopian Society of Animal Production held 5-7 September, 2006, Addis Ababa, Ethiopia. (In press).

Wood JD, Enser M, Fisher AV, Nute GR, Richarson I, Sheard PR (1999). Manipulating meat quality and composition. Proceedings of the Nutrition Society, 58: 363-370.