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INTERNATIONAL JOURNAL OF
Agricultural Science and Food Technology

ISSN: 2455-815X DOI: https://dx.doi.org/10.17352/ijasft

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Received: 21 May, 2019
Accepted: 16 July, 2019
Published: 17 July, 2019

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Keywords: Kereyu bulls; Export weight; Carcass and concentrate feeds

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Research Article

Evaluation of different feeding options on growth response and carcass characteristic of yearling Kereyu-Bulls to attain local/export market weight

Abstract

The study was conducted at Adami Tulu agricultural research center on growth performance and carcass characteristics evaluation of one year old 24 Kereyu bulls. The objectives of the fattening trial were: to evaluate different feeds options on one year aged Kereyu bulls for them to attain 300kg export market weight gain, to evaluate the carcass characteristics of the animals under fattening and to identify the most economical feeding options to obtain the targeted export market weight gain. Three feeding treatments (T1=Rhodes hay +20% molasses+ 40% wheat bran+ 40% Noug cake, T2 = Rhodes hay +20% maize grain+45% wheat bran+35% Noug cake and T3= Rhodes hay + 65% wheat bran+ 35% cotton seed cakes) were evaluated. Complete Randomized Block Design was implemented to assign nine Kereyu bulls to the three treatments. All the experimental bulls were supplemented with their respective feed rations at 2.5% of their body weight per day during the whole experimental period. The result of the fattening trials revealed that there is no significant difference in daily weight gain, total weight gain, final body weight and carcass characteristic of bulls received the three dietary feeds for 179 fattening days.

Introduction

Ethiopia has the largest cattle population in Africa with an estimated 59.5 million heads of animals [1]. Cattle with their large number and diverse products contribute about 12% and 33% of the total and the agricultural GDPs, respectively. However, the earning from exporting of live animals and processed meat is very small as compared to the potential of the country. The average Ethiopian beef yield per animal of 135 kg is by far less than the 146 kg for Africa and 205 kg for the whole world [2-4].

Different feed options fed to cattle of different age groups for different length of fattening periods played a significant role in bringing the animals to export market weight required. In addition to the effect of dietary feeds, various fixed effects have their own role on growth performance and carcass characteristics of animals among these factors breed and age of the animals played an important role.

The effort made so far regarding fattening of beef cattle at different research centers less targeted the export market weight demand. Mainly they targeted domestic markets. To solve the underlying constraints different research proposals were developed by different agricultural research institutions in order to release feasible and promising fattening technologies for end users. To this end, previous studies [5-7], conducted to evaluate different feeding options on different cattle breeds of varied ages groups has played a vital role in improving the foreign currency earning the country can get from the sale of meat and live animal. Moreover, conducting such cattle fattening activities can bring a significant change on income of the fatteners. Hence, this study on evaluation of feeding options for one year old Kereru bulls was developed to cover the following objectives.

Objective

To evaluate and identify the most economical feeding options for one year old Kereyu bulls fed on different feed options for the bulls to attain export market weight of 250 - 300kg.

To evaluate the growth and carcass characteristics of Kereyu bulls.

Materials and Methods

Description of the study area

The experiment was conducted at Adami Tulu Agricultural

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Research Center, which is located in mid rift valley at 167 km from the capital city Addis Ababa, Ethiopia at an altitude of 1650 m above sea level. The agro ecological Zone of the area is semi-arid and sub humid with acacia woodland vegetation type. The mean annual rain fall of the area is 760 mm and its mean minimum and maximum temperatures are 12.6 and 27°C, respectively.

Experimental animals

For this experiment 24 one year old Kereyu bulls were purchased from Fantale market. The purchased bulls were transported to Adami Tulu agricultural research center and the animals were kept under quarantine in a separate barn and were treated against internal and external parasites before the commencement of the fattening trial. The animals were also vaccinated to control the most important diseases in the area.

Dietary feeds treatments

The following three different supplementary concentrate feeds were used.

T1 = Rhodes hay +20% molasses+ 40% wheat bran+ 40% Noug cake

T2 = Rhodes hay +20% maize grain+45% wheat bran+35% Noug cake

T3= Rhodes hay + 65% wheat bran+ 35% cotton seed cakes.

The DM, total CP and TDN content of the feeds is depicted in table1.

Feeding the experimental animals

In addition to hay feeding, every day all the experimental bulls were supplemented with the above mentioned concentrate feeds at the rate of 2.5% of their body weight throughout the fattening period. This provision of concentrate was adjusted every two weeks depended on the weight change of the experimental bulls during the whole fattening period. All experimental animals were individually fed their respective diet for the whole experimental period. The daily allocated feed was divided into two equal amounts to offer twice per day; half in the morning and half in the afternoon. Feeding of the experimental bulls was extended to 179 days until the bulls had attained, on average, the required export body weights of 250-300kg.

Table 1: Chemical composition of the supplementary concentrate feeds.

Type of feeds	Treatment	DM%	CP%	TDN%
Molasses	T1	20	1.16	14.4
Wheat bran	T1	40	5.52	26.80
Noug cake	T1	40	11.9	26.4
Total		**100**	**18.58**	**67.6**
Maize grain	T2	20	2	17
Wheat bran	T2	45	5.85	30.15
Noug cake	T2	35	10.41	23.1
Total		**100**	**18.26**	**70.25**
Wheat bran	T3	65	8.45	43.55
Cotton seedcake	T3	35	9.8	26.25
Total		**100**	**18.25**	**69.8**

Where:- DM= dry matter, CP = crude protein and TDN= total digestible nutrient.

Average daily weight gain (ADG) of the bulls was calculated using the following formula.

$$ADG = \frac{(FWT - IWT)}{D}$$

Where: FWT = Final body weight

IWT = Initial body weight

D = number of fattening days

Evaluation of carcass characteristics

At the end of the experimental period three fattened bulls were randomly selected from each treatment group and slaughtered at Adami Tulu Agricultural Research Center abattoir. Then the animals were skinned, all important internal organs such as kidney, heart, liver, lung, spleen, empty gut, heart fat, kidney fat, mesenteric and omental fat were eviscerated and the required carcass parameters were individually measured. The hot carcass were dissected symmetrically into right and left parts with the help of modern electrical carcass cutting machine and the weight of each part of the entire carcass was measured before the carcass was put into cold room at -4°c for about 24 hours. After 24 hours stay, the cold carcasses parts were measured again to evaluate the difference in weight change between the hot and the cold carcass of each slaughtered animal. To evaluate the chilled carcass characteristics, the right parts of each slaughtered bull were cut into five major carcass parameters.

Partial budget analysis

All costs incurred for fattening the experimental bulls using the three dietary feeds were recorded in order to calculate economic returns of fattening the bulls. Total variable costs incurred, such as animal purchase, transportation, feeds, labor and veterinary costs were collected. The gross output/revenues from the bulls were estimated at the end of the fattening period by the help of three persons who have enough knowledge on prices of fattened animals. Fixed costs incurred and the cost of grazing was not included in the analysis. Hence, this partial budget analysis indicates only gross margin of fattening bulls using the three different feed options.

Statistical analysis

Data of all live weights and carcass parameters were analyzed using the general linear model (GLM) of Statistical Analysis System [8]. The estimated least squares means were separated using the Duncan's Multiple Range Test at $P< 0.05$.

Results and Discussion

Effects of dietary feeds on weight gains

Least-square means (LSM) of final body weight (FBW), total weight gain (TWG) and average daily weight gains (ADG)

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of the bulls fed on the different rations are indicated in table 2. The results showed that there are no statistically significant differences (P>0.05) in ADG, TWG and FBW among T1, T2 and T3. However, the experimental bulls fed on T3 gained more weights (ADG of 807.26g, TWG of 144.50kg) and attained higher FBW (291.63) than the experimental bulls fed on T1 and T2. This result agrees with the previous findings by Tesfaye et *al.*, [7], for two years-old Kereyu bulls and Tewodros *et al.*, [9], for two years old Fogera bull fed with the same type of feeds. The final body weight attained in the present study was almost similar with what Tesfaye et *al.*, [7], reported for two years-old Kereyu bulls fed on the same feeding options .

The daily weight gain (807.26 gm) of bulls fed on T3 is more or less similar with the finding of Tesfaye A.T., *et al.*, [7], who reported the daily weight gain of 810 gm for two years old Kereyu bulls fed with similar ration. The one year old Kereyu bulls approached more or less the required 250 to 300 kg of export market weight demand at 179 days of feeding. This is duration is shorter when compared with the 224 fattening days taken by one year old Borana bulls to reach a 300 kg body weight [6]. On the other hand, the final body weight of the one year old Kereyu bulls at 179 fattening days is similar with the FBW of attained by two years old Kereyu at 168 fattening days [7]. The trend of daily weight gain of each experimental bulls fed on three different feeds ration over the whole 179 fattening day is indicated in figure 1. The weight change of one year old Kereyu bulls were steadily decreased as the number of the fattening period is increased from 140 days to the end of the fattening periods. This result disagree with report of Mieso G., *et al.*, [6], whom reported the ADG of one year old Borana bulls were decreased as the number of the fattening period is increased from 70 days.

Effects of dietary feeds on carcass components

The result of carcass evaluation of the bulls fed on the three different feed options is shown in table 3. As the result reveals the carcass composition of the experimental bulls fed on different feed options did not vary statically. However experimental bulls fed T3 registered higher SWT, HCW, and lower Bone, lean and Fat parameters when compare to bulls fed on T1 and T2. Animals fed on T3 (Rhodes hay + 65%wheat bran+ 35% cotton seed cakes) had lower fat composition than animals fed on the other two treatments. This result is similar with the finding of Mieso *et al.*, [6], who indicated the absence of significant difference in carcass components among yearling Borana bulls

The bone, fat and muscle ratios of the bulls fattened for 179 days on the three different feeds option is indicated in figure 2.

Dietary effect on non-edible parts (Offals)

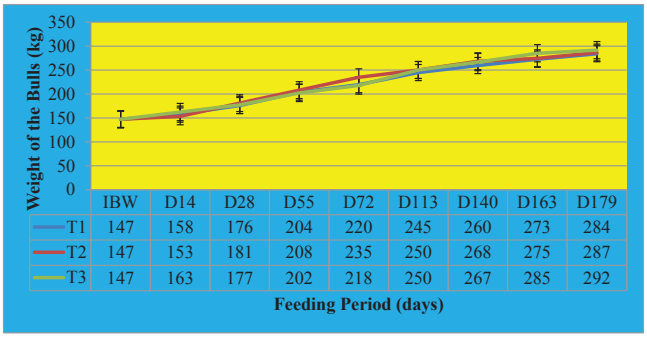
Even if slight variations were observed among bulls fed different rations in some non-edible parts; there were no significant differences in all of the offal measurements among the bulls. This is indicated in table 4.

This result is similar to what has been reported by Tesfaye and Tasfa [7,10,11], Kereyu bulls fattened on different finishing rations

Table 2: Body weight gain of one-year old Kereyu bulls fed on different feeds for 179 fattening days.

Parameter	T1	T2	T3
ADG (g)	765.36 ±44	779 ±31.98	807.26 ±23.15
TWG (kg)	137 ±7.92	139.50 ±5.73	144.50 ±4.14
FBW (kg)	284.13± 12.96	286.75 ±10.27	291.63 ±6.24

Where ADG = average daily gain, TWG= total weight gain, FBW= Final body weight, T1= treatment one, T2= Treatment two and T3= Treatment three.



Where: - IBW=initial body weight, D14= day 14, D28= day 28, etc up to D179=day 179th

Figure 1: Body weight change of one year old Kereyu bulls over the total fattening period.

Table 3: Carcass parameters of yearling Kereyu bulls fed the three feed options.

Parameter	Treatments		
	T1	T2	T3
SWT	295.75 ± 16.66	293.25± 17.04	297.00 ± 3.34
HCW	149.25 ± 11.84	147.00 ± 14.75	151.00 ± 1.09
LEAN	52.51 ± 2.80	52.48±2.07	49.33±1.84
BONE	14.78 ± 0.33	12.83±0.21	12.28±0.33
FAT	16.91±2.35	16.06±1.16	12.29±0.57
Dressing %	50.29	49.77	50.84

Where:- *SWT = Slaughter weight, HCW = Hot carcass weight , T1 = treatment one, T2 = Treatment two and T3 = Treatment three.*

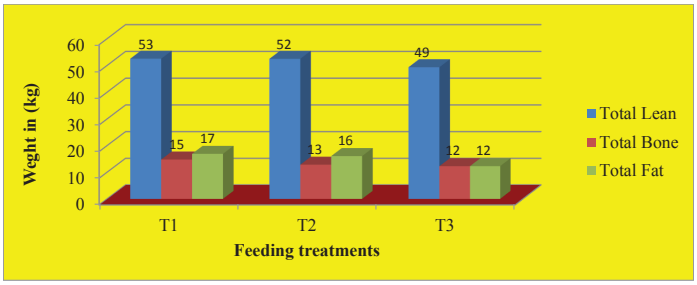


Figure 2: Fat, muscle and bone proportions of the bulls.

Economic return on fattening of one year old Kereyu bulls

The result of partial budget analysis of fattening the one year old Kereyu bulls fed on the three different feeds for 179 days is indicated in table 5. The results showed that experimental bulls fed on T1 had higher gross margin per animal (4813.00) than bulls fed on T2 (4521.23) and T3 (3638.30). Feeding with T3 is found to be less profitable as compare to feeding with

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Table 4: Least square mean of offal measurements of yearling Kereyu bulls fed the different feeds.

Parameter	Treatments		
	T1	T2	T3
Tail	0.81±0.01	1.03±0.15	0.69±0.01
Feet with hooves	5.65±0.36	4.70±0.21	4.74±0.08
Lung and Trachea	2.89±0.31	2.71±0.15	2.36±0.10
Heart fat	0.53±0.06	1.00±0.13	0.93±0.23
Spleen	1.01±0.05	1.01±0.10	0.93±0.05
Kidney fat	4.04±0.57	4.45±0.46	3.54±0.59
Bladder	0.11±0.01	0.13±0.01	0.10±0.04
Liver + Bile	4.21±0.41	4.20±0.53	3.65±0.26
Pelvic fat	1.24±0.26	1.50±0.15	1.40±0.24
Omental fat	3.58±0.24	4.13±0.29	3.44±0.42
Testicle	0.64±0.06	0.50±0.03	0.46±0.04
Penis	0.50±0.02	0.44±0.03	0.44±0.02
Scrotal fat	2.06±0.23	2.40±0.02	1.64±0.16

Table 5: Partial budget analysis of fattening yearling Kereyu Bulls on different feed options.

List of Items	T1	T2	T3
Number of bulls	8	8	8
Purchasing price/ bull	2144.75	2069.75	2125
Transportation/ animal	300	300	300
Cost of concentrate/ animal	6439.23	6722.83	7271.16
Labor cost per animal	787.5	787.5	787.5
Veterinary cost/animal	59	59	59
Total cost per animal	9730.48	9939.08	10542.66
Gross return per animal	14543.48	14460.31	14180.96
Gross margin per animal	4813.00	4521.23	3638.30

T1 and T2. This is because of the high cost of cotton seed cake used in T3. But the cost of molasses used in T1 and the cost of maize grain used in T2 are relatively low as compare to other feed items used in T3. In general, fattening one year old Kereyu bulls for 179 days for export/local market by using any of the three different feeding rations is profitable.

Conclusion and Recommendation

From the result of the experiment, it can be concluded that even if there are numerical differences, there are no statistically significant differences in daily weight gain (DWG), total weight gain (TWG), final body weight (FBW) and carcass characteristics among the one year old Kereyu bulls received the three different feed options for 179 fattening days. This may be because of the similarity of the bulls both in breed and age. Moreover the same percentage of total CP and TDN were provided for all of the experimental animals. Economic analysis of the different dietary treatment groups showed that, all the three feeding options are profitable for fattening growing Kereyu bulls and to obtain the required export market weight. Therefore, cattle fatteners can use one of the three feed options, depending on availability and accessibility of the feeds, for fattening one year old Kereyu bulls for export/local markets as the animals could attain the required weight of 250-300kg within 179 days of feeding.

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