

Effect of Different Feed Options on Growth Response of Two Years Aged Begaria Bulls for Export Market Weight Gain at Pawe Agricultural Research Center

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Abstract: The experiment conducted at Pawe Agricultural Research Center, with the objective to evaluate Begaria bulls for attaining the required export market weight of 300kg and their carcass characteristics of under different feeding options. The experiment conducted for ninety days. The experimental treatments were: (T1), Natural pasture hay + 2500 gram maize grain + 390 gram soybean grain, (T2), Natural pasture hay + 2500 gram maize grain + 530 gram noug seed cake (NSC), (T3), Natural pasture hay + 2500 gram maize grain + 182 gram soybean grain + 268 gram NSC, and (T4), Natural pasture hay + 2500 gram maize grain + 268 gram soybean grain + 134 gram NSC. Natural pasture hay was provided to the bulls ad libitum throughout the experimental periods and concentrate supplements were provided twice a day with pre-determined amount. Experimental animals (bulls) fed on T3 were showed higher in total dry matter intake (7.86kg/day), crud protein intake (743.92gr/day), final body weight (262.80kg), average daily gain (0.99kg) and slaughter body weight (268.75kg). Feeding Begaria bulls with combinations in treatment three can result in better performance. Achieving the export market weight (300kg) of Begaria bulls may need further investigation and better management at growing stages of the bulls.

Keywords: Pawe, Begaria, Carcass, Body Weight and Bull

1. Introduction

Livestock plays multiple roles in the Ethiopian economy by providing food, input for crop production and improve soil fertility, raw material for industry, cash and promoting saving for the family, source of fuel, provision of other social functions, and employment.

Ethiopia is the home of diverse cattle genetic resources due to its diversified agro-ecology, topography and its nearness to the get of Asia, which were potential origin of most domesticated animals for Africa. Ethiopia has an estimated total number 70 million cattle, 42.9 million sheep, 52.5 million goats, 8.1 million camels and 57 million chicken [1].

Benishangul Gumuz Region constitutes large livestock resources of cattle, sheep, goat, mule, poultry and bee hive, 595228, 61335, 446323, 3457, 1155535 and 171775, respectively (CSA, 2021). The region has total cattle population 595228 and out of these Metekel zone accounts 467989 and it is 78.62% of the region cattle found in Metekel [1].

Cattle contribute a lot to improve the wellbeing of the farm family through food supply, balancing nutrition, family income, savings, insurance, ritual and other social purposes [2].

Begaria cattle are distributed in Guba district, Metekel Zone of Benishangul Gumuz Regional State. They are dual-purpose breeds, adapted in hot environment, with uniform and

dominantly white and grey body coat color [2]. Begaria cattle have short horn size and white or creamy coat color with dark gray shades to the neck, head, and hump. The breed is large as compared to the breeds in the adjoining areas. The breed also has fast growth and they are highly demanded for meat by the domestic market and export market in the adjoining Sudanese areas [3].

Ethiopia has the lowest level of beef production annually per head of cattle and the national per capita meat yield from cattle is 108 kg [4]. To improve this scenario looking for different feeding options for Begaria bulls to attain the desired market weight and carcass quality at an earlier age is a paramount important. Accordingly, the main objective of this study was to evaluate Begaria bulls for attaining the required export market weight of 300kg and the carcass characteristics under different feeding options.

2. Methodology

2.1. Description of the Study Area

The experiment conducted at Pawe Agricultural Research Center, which is located at 567 km from Addis Ababa, the capital city of Ethiopia at an altitude of 1100 meters above sea level in North West of Ethiopia. The agro ecological zone of the area is semi-arid and sub humid with mixed crop- livestock production system. The mean annual rainfalls is 1064 mm. The mean minimum and maximum temperature are 17 and 35, respectively.

2.2. Experimental Animal Management and Design

A total of 20 two-year old Begaria bulls were purchased from Guba local market. After the purchased bulls were reached at Pawe agricultural research center, all experimental animals were kept in quarantine for about 3 weeks and treated for internal and external parasites by using Albendazole and acaricide respectively. Vaccine was given for common cattle diseases in the study area. All experimental bulls were randomly assigned to one of the four dietary treatments groups. For each four dietary treatments (T1, T2, T3 and T4) 5 bulls were assigned throughout the experimental period. All experimental animals were individually penned and fed with their corresponding rations for 15 days of acclimatization period before the commencement of actual experiment.

Randomized Complete Block Design was used for executing the experiment. The purchased bulls were block based on three days average initial body weight. Daily feed offered was adjusted at 3% of their body weight and 20% refusal rate was added. The natural grass hay was provided ad libitum by closely follow up of the status of the animals' consumption. The concentrate mix was provided twice a day at 10: 00 AM and 4: 00 PM. Clean water and mineral lick was provided at free choice.

2.3. Treatments

The treatments used during the execution of the experiment are present in Table 1. The amount of concentrate feeds were

isonitrogenous.

Table 1. The amount of concentrate feed ingredients provided for treatment groups.

Treatment	Natural pasture hay	Maize (gr)	Soybean (gr)	NSC (gr)
1	Adlibitum	2500	390	-
2	Adlibitum	2500	-	530
3	Adlibitum	2500	182	268
4	Adlibitum	2500	268	134

NSC = Noug seed cake; gr = Weight in grams.

2.4. Body Weight Change and Carcass Characteristics

Live weight change was measured every 15 days and the feed requirement for each treatment was adjusted accordingly every 15 days on the weighing date. At the end of the experimental period, final body weight have been taken and bulls were slaughtered. After the animals were slaughtered and skinned, all important internal organs of each bull, such as kidney, heart, liver, lung, spleen, empty gut, heart fat, kidney fat, mesenteric and omental fat were eviscerated and measured. The rest hot carcass of the slaughtered bulls were measured. The rib eye area muscle was recorded by cutting the longissimus dorsi muscle at 11th and end, then chill the cut for 12 hours in deep refrigerator and cutting between 12th and 13th ribs. The ribeye muscle area was traced on the transparency paper and the area was determined using 1cm by 1cm grid square. The number of squares failed in the traced area were counted and recorded as the area of rib eye muscle.

2.5. Statistical Analysis

Collected data were subjected to the analysis of variance (ANOVA) using the GLM procedure of SAS (version 9.4). Significant treatment means were separated using Tukey HSD (Tukey Honestly Significant Difference Test). The statistical model was:

$$Y_{ij} = \mu + T_i + \beta_j + e_{ij}$$

Where: Y_{ij} = the response variable

μ = Overall mean

T_i = i th treatment (test diets) effect

β_j = j th block effect

e_{ij} = the random error

3. Results and Discussion

3.1. Chemical Composition of Feed Ingredients

The chemical composition of feed ingredients used for the experiment was presented in Table 2. The CP content of natural pasture hay was found to be sufficient for maintenance requirement of ruminants. The CP content >7% is adequate for proper function of rumen microbes and to meet maintenance requirement of animals [5], given other factors such as lignification does not limit feed digestibility and nutrient utilization. This result (7.23%) was comparable with the result reported by [6]. Noug seed cake and soybean grains also contains 32.78% and 39.35% CP. The CP content of soybean grain was

lower than 41.27% reported by [6], while the CP content of noug seed cake is higher than the result reported by [7].

Table 2. Chemical composition of the feed ingredients.

Chemical composition	Feed ingredients			
	Natural pasture hay	Maize grain	NSC	Soybean grain
DM%	93.14	90.5	95.54	95.57
Ash%	8.24	1.6	0.76	6.69
OM%	91.76	90.21	94.38	93.42
CP%	7.23	9.7	32.78	39.35
NDF%	64.57	18.7	40.18	43.67
ADF%	44.67	3.7	33.12	22.02
ADL%	10.89	1.5	12.05	4.77

NSC = Noug seed cake; DM = Dry matter; OM = Organic matter; CP = Crude protein; NDF = Neutral detergent fiber; ADF = Acid detergent fiber; ADL = Acid detergent lignin.

3.2. Feed and Nutrient Intake

The feed and nutrient intake of Begaria cattle was presented in Table 3. Concentrate feed intake was different ($P < 0.001$) among treatments. The natural pasture hay dry matter intake was different ($P < 0.05$) between treatments T1 and T3. The higher dry matter intake of natural pasture hay was recorded in T3 (5.17 kg/day/animal) than other treatments. This may be due to higher crude protein intake of T3. According to [8] an increase in total dry matter intake as the level of crude protein increases in the diet.

Total dry matter intake of treatment three was significantly different ($P < 0.01$) from treatments T1 and T4. Dry matter intake is considered as an important factor in the utilization of roughage by ruminant livestock and is a critical determinant of nutrient intake and performance in ruminants [9]. The crude protein intake was higher in treatment three than other treatments. It is directly correlated with total dry matter intake that is as the total dry matter intake increases the nutrient intake also increase. This is true for other nutrients other than CP.

Table 3. Daily dry matter and Nutrient intake of Begaria bulls.

Parameters	Treatments				SEM
	T1	T2	T3	T4	
Feed dry matter intake (DMI)					
Concentrate DMI (g/day)	2.64d	2.77a	2.69b	2.65c	0.01
Natural hay DMI (kg/day)	4.73b	4.81ab	5.17a	4.78ab	0.09
TDMI (kg/day)	7.36b	7.58ab	7.86a	7.43b	0.09
TDMI (%BW)	2.97b	3.46a	3.11b	3.19ab	0.13
Nutrient intake					
CPI	706.49b	731.98ab	743.92a	706.51b	6.69
OMI	6911.9b	7145ab	7384.6a	6980.2b	85.25
NDFI	3638.27b	3734.24ab	3938.74a	3674.05b	59.99
ADFI	2277.47b	2401.35ab	2515.25a	2318.58b	41.5
ADLI	568.78c	621.34ab	638.12a	584.59bc	10.12

DMI = Dry matter intake; OMI = Organic matter intake; CPI = Crude protein intake; NDFI = Neutral detergent fiber intake; ADFI = Acid detergent fiber intake; ADLI = Acid detergent lignin intake; TDMI = Total dry matter intake.

3.3. Body Weight Change

The body weight change was indicated in Table 4. The initial body weight was not significantly different among treatments. The final body weight was significantly higher in treatment three than treatment four. This might be due to the higher total dry matter and nutrient intake of animals in

the treatment three. There was no significant difference on average daily gain among treatment groups, but numerically treatment three shows higher average daily weight gain than the rest of treatments. The numerical average daily gain value was higher from the results found in Borana bulls reported by [10].

Table 4. Body weight change of Begaria bulls fed on different feed options.

Body weight change	Treatments				SEM
	T1	T2	T3	T4	
Initial body weight (kg)	165.92a	159.36a	163.84a	157.28a	3.47
Final body weight (kg)	246.10ab	254.40ab	262.80a	240.60b	4.81
ADG (kg/day)	0.78	0.94	0.99	0.82	0.05

ADG = Average daily gain

In the first two weeks of experimental periods, animals shown an exponential body weight change in all treatments (Figure 1). The body weight change after two weeks was

steadily increase to the end of the experimental period. The graph shows that Begaria bulls does not manifest their maximum potential in these experimental periods.

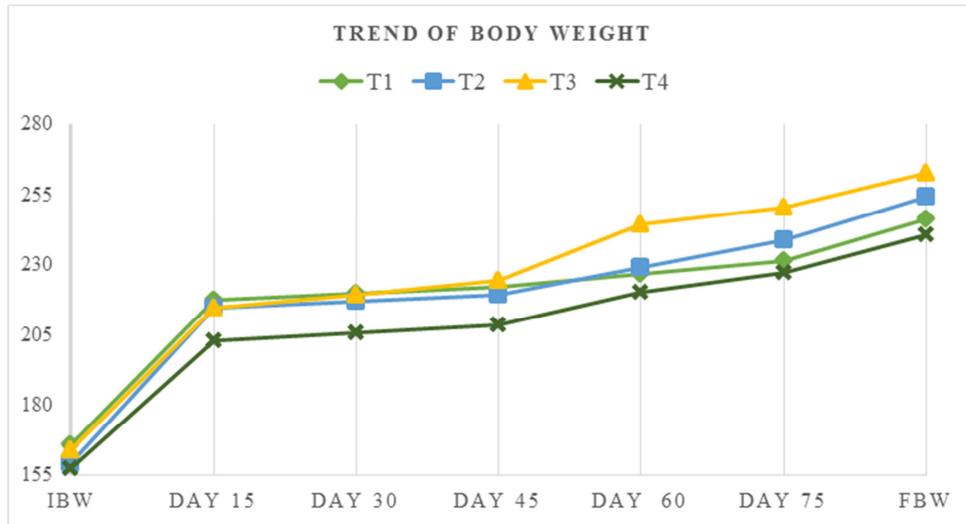


Figure 1. Trend of body weight change of Begaria bulls fed on different feed options.

3.4. Carcass Characteristics

The carcass characteristics of the Begaria bull fed on different feed options is indicated in Table 5. In the study area ofals like liver, heart, stomach, small intestine and kidney were considered as edible ofals. Significant difference was manifested among treatments on slaughter body weight. Treatment three has shown higher (268.75kg) slaughter body weight followed by treatments one, two and four respectively. This may be due to the higher dry matter intake of animals in treatment three. Because dry matter intake is considered as an

important factor in the utilization of roughage by ruminant livestock and is a critical determinant of nutrient intake and performance in ruminants [9]. The higher (55.07%) and lower (52.02%) dressing percentage on slaughter body weight basis was recorded in treatment four and one respectively. The rib eye area muscle was not statistically different among treatment groups. Numerically treatment two shows higher rib eye area muscle followed by treatment three. Other parameters like liver, kidney, heart, lung, stomach and small intestine were not shown significant difference in all treatment groups.

Table 5. Carcass characteristics of Begaria bulls fed on different feed options.

Carcass characteristics	Treatments				SL	SEM	CV
	T1	T2	T3	T4			
Slaughter body weight (kg)	253.25ab	252.25ab	268.75a	242.88b	0.02	10.36	5.76
Hot carcass weight (kg)	132.75	136.25	142.00	133.75	0.71	8.63	8.96
Dressing percentage (DP %)	52.02	53.94	52.88	55.07	0.74	2.89	7.65
REMA (cm ²)	142.20	159.06	145.31	138.56	0.26	7.29	11.15
Liver (kg)	3.78	3.60	3.88	3.75	0.79	0.28	10.42
Heart (kg)	1.08	1.08	0.83	1.18	0.48	0.22	29.96
Kidney (kg)	0.50	0.48	0.55	0.75	0.10	0.11	26.25
Lung (kg)	3.48	3.63	3.58	2.85	0.34	0.45	18.73
Stomach (kg)	11.38	10.60	18.78	10.35	0.34	5.03	55.68
Small intestine (kg)	3.55	4.20	3.50	3.70	0.57	0.53	20.19

4. Conclusion and Recommendation

The study was conducted at Pawe agricultural research center, north western part of Ethiopia. Begaria cattle are distributed in Guba district, Metekel Zone of Benishangul Gumuz Regional State. They are dual purpose breeds, adapted in hot environment, with uniform and dominantly white and grey coat color. The total dry matter and CP

intake was higher in bulls provided with ad libitum natural pasture hay, 2500gr maize grain, 182gr soybean grain, and 268gr nug seed cake. This group also shown higher final body weight and average daily weight gain. Similarly, the higher slaughter weight was recorded from those treatment groups. Rib-eye area muscle was not significantly different among treatment groups.

Generally, feeding of Begaria bulls with ad libitum natural pasture hay, 2500gr maize grain, 182gr soybean grain, and

268gr nug seed cake resulted better performance in terms of feed intake, final body weight, slaughter weight and average daily weight gain. Therefore, we recommend the above indicated feed composition to get better results in Begaria cattle fattening.

Future work

Feeding of the Begaria bulls to their potential results better performance rather than limiting the experimental days. Achieving the export market weight (300kg) of Begaria bulls may need further investigation and better management at growing stages of the bulls.

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