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Experment on Feedlot Performance of Hararghe Highland Cattle

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Abstract: The experiment was conducted at Haramaya University with the objectives to evaluate feedlot performance of Hararghe highland cattle using a combination of the existing indigenous knowledge, the major feed resources used of the traditional system and improved practices/supplementation. For conducting the current feeding trial, twenty-four yearling intact male Hararghe highland cattle with a mean live weight of 149.46±16.08 and mean age of 3.0±0.41 years were used. The experiment consisted of ninety days of feeding trial and seven days of digestibility trial followed by the evaluation of carcass parameters at the end of the experiment. Dietary treatments consisted of maize stover alone offered ad libitum, 3kg concentrate mix of Wheat bran (WB) and Niger Seed cake (NSC) at a ratio of 2:1, respectively (T_1), maize stover alone offered ad libitum, 3kg concentrate fortified with 2.6g of yeast (T_2), maize stover alone offered ad libitum, 3kg concentrate fortified with 3.9g of yeast (T_3), maize Stover alone offered ad libitum, 3kg concentrate fortified with 5.2g of yeast (T_4), per head per day on as feed bases. The experimental cattle were blocked into six blocks of four animals based on initial live weight and randomly assigned to one of the four treatment diets. The total Dry matter intake (TDM) and Acid detergent fiber (ADF) of bulls fed maize stover and concentrate feed fortified with Saccharomyces cerevisiae yeast increased ($P<0.05$) compared to that for non-supplemented bulls. Acid detergent lignin (ADL) and Ash intake significantly increased ($P<0.01$) in yeast group than non yeast group. No significant difference ($P>0.05$) was observed in apparent digestibility of Dry matter (DM), Organic matter (OM), Crud protein (CP), Neutral detergent fiber (NDF) and Acid detergent fiber (ADF) between the control and yeast treated group and digestibility of all DM, OM, CP, NDF and ADF were higher numerically at 3.9g of yeast, whereas ADL digestibility significantly improved ($P<0.05$) for yeast group. The final body weight and the average daily gain significantly ascended ($P<0.05$) in yeast group bulls but no effect was observed for the feed conversion ratio. There was no significant difference ($P>0.05$) between yeast group and non-yeast group bulls in all carcasses parameters except hump, although all parameters measured are numerically by far higher in yeast than non yeast groups.($P<0.05$). In conclusion, The supplementation 3.9g of yeast improved the fattening body weight gain. Further studies are recommended to explore the different ratios of supplementing yeast with basal diet, since the present result is not conclusive.

Key words: Body Weight Gain · Body Condition Score · Carcass Characteristics · Digestibility · Feed Intake · Supplementation · Hararghe Highland Cattle

INTRODUCTION

It has been known that there is a long tradition of oxen fattening by small holders farmers of Hararghe highlands. They fatten bull using locally available feeds and sell the fattened bull bring a premium price both at the local and Addis Ababa market. Oxen are known by the name ‘’Harar Sanga’’ throughout the country. The oxen also are highly smuggled to the neighboring countries, Somalia and Djibouti. The primary objective of keeping cattle by farmers in the area, however, is not different from that of other highlands of the country. Oxen are not kept to produce high grade beef, but for traction power, farmyard manure, crop treshing and to build up capital saving [1,2]. Farmers in Hararghe have a good experience of market oriented livestock management and livestock has a social value and farmers in the area give special place particularly for male cattle.

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Some research results in the present study area indicated the existence of a serious feed shortage, especially during the dry season. The grazing area available to individual farmer is diminishing and the marginal areas are deteriorating. Therefore, animal husbandry activity in the area is entirely dependent on crop production [3-5]. However, the byproducts from crop production are low in their nutritive value and cannot support short term fattening, the limitations imposed on the performance of animals due to poor feed quality and feed shortage source could be partially overcome by practicing feed supplementation. Some of the existing reports so far available [6-8] showed that beef cattle supplemented with concentrates gain more weight that increased dressing percentage. The performance of the traditionally fattened animal breed in terms of live weight gain and nutrient utilization under different regimes of supplementation was not also studied in detail. The current study is therefore, designed to evaluate feedlot performance of Hararghe highland cattle using a combination of indigenous knowledge that exists, the major feed resources used in the traditional system and improved practices/supplementation.

MATERIALS AND METHODS

The study was conducted on twenty four Hararghe highland breed indigenous male cattle with a mean age of 3.0±0.41 with a range from 2.10 to 3.6 years. The mean initial body weight of the experimental animals was 149.46±16.08. The cattle were vaccinated for common diseases, dewormed and sprayed against internal and external parasites, respectively during the 2 weeks quarantine period. At the end of the quarantine period, cattle were weighed and blocked into six blocks of four animals each and randomly distributed to one of the treatment feeds (Table-1). Animals were kept in individual pens equipped with feeding troughs. All animals were identified with ear tag. Following the quarantine period, animals were acclimated to the treatment diet and experimental procedures for 15 days. During this period animals were feed a basal diet of maize stover and concentrate feed of wheat bran and noug seed cake mixed with the ratio of 2:1 and fortified with different levels of yeast (*Saccharomyces cerevisiae)*.

Experimental Feeds and Feeding: Major feed used for fattening during dry season by the farmers in Hararghe highlands which is maize stover, as a basal diet and a mix of wheat bran and noug meal as a supplement feed were used for the experiment. One of the identified indigenous knowledge was use of yeast to prepare a supplement feed. The yeast (*Saccharomyces cerevisiae)* was used to set the experimental treatments. Maize Stover was chopped before the start of the experiment at about 10 cm by using a tractor mounted chopper and thoroughly mixed and stored to reduce any variation when fed during the experiment. Farmers ferment maize flour with yeast and feed to animals usually at an interval of a week or less depending on capacity to offer. To simulate farmers practice, 1kg of wheat bran plus 3 lit of water were mixed with different levels of yeast according to the treatment in a plastic bucket stirred and left over night to ferment. The next morning, the remaining 1.1kg of wheat bran and 0.9 kg of noug meal were added to the fermented feed and thoroughly mixed and offered to the animal. The diet was prepared for each animal separately on a daily basis. The supplemented feed was offered once in the morning at 8:00. The daily stover allowance was offered *ad libitum* (20% refusals rate). The animals were penned in a well-ventilated barn with continuous access to water and mineral lick.

Experimental Design and Treatments: The experiment was conducted using a randomized complete block design (RCBD) with four treatments. Experimental animals were blocked in to six blocks of four animals based on initial live weight. Within a block, animals were randomly allocated to the experiment treatments. The initial body weight of cattle as a mean of two consecutive weights were taken after over night fasting before the commencement of the experiment (Beginning of adaptation period). The animals in the control and yeast treatments received maize stover alone offered *ad libitum*. The animals in the three yeast treatments were supplemented with 2.6g (T2), 3.9g (T3) and 5.2g (T4) of yeast (Table 1). The level of yeast used is based on farmers practice.

Table 1: Experimental treatments

Treatments	No. of cattle	Maize stover	Supplement (kg/d)	Level of yeast(g)
Treatment 1(control)	6	*Ad libitum*	3kg (WB and NSM)	0
Treatment 2	6	*Ad libitum*	3kg (WB and NSM)	2.6
Treatment 3	6	*Ad libitum*	3kg (WB and NSM)	3.9
Treatment 4	6	*Ad libitum*	3kg (WB and NSM)	5.2

NSM = noug seed meal and WB =wheat bran; 1:2 ratio, respectively.

Measurements

Feed Intake: Every morning, maize stover were weighed and offered to each experimental animal. The amount of offer was adjusted every week based on the previous week intake by the animal. Wheat bran and noug seed meal was weighed individually mixed and offered as explained earlier. Daily feed intake of the individual animal was recorded as the difference between feed offered and refused. At the end of the experiment, feed offer samples were bulked and representative samples were taken for chemical analysis. Samples of refusals collected from each animal were bulked, per treatment and a sample was taken after thorough mixing. Feed conversion efficiency (FCE) for each cattle was expressed as the ratio of average daily body weight gain (gADG) to average daily dry matter intake(g/day).

Body Weight Gain: Animals were weighed at the beginning of the experiment by using weighing scale (True test digital balance) and at fifteen days throughout the experiment interval after overnight feed withdrawal and before daily feed offer. Average daily weight gain were calculated as the difference between final live weight and initial live weight of the animal divided by the number of feeding days. Body weight records taken every 15 days were used to plot trends in body weight change.

Body Condition Scoring: Animals were scored by external visual examination of those parts of the body which best indicates the animal's condition (over hump, ribs, transverse processes, lumbar fossa, tail head, brisket and cod) by a previously trained and experienced individual. The body weight scoring was done according to a nine-point system for African Zebu cattle scale method developed by ILCA [9].

Feeding Trial*:* Following the adaptation period of 15 days to the experiment environment, the animals were blocked by body weight and randomly distributed within block into four groups and put into an individual pen. The treatment diets were randomly assigned to each animal in a block. Then, the animals were adapted to the experiment feed for 15 days after which the actual data collection resumed. Feeding trial was carried out for a total duration of 90 days.

Digestibility Trial: The digestion trial was undertaken with all experimental animals between 70 and 80 days of the feeding trial. The concrete floor of each pen were properly washed a day before feces collection started and cleanness maintained throughout the collection period. Feces voided by each animal on the concrete floor were immediately removed by attendants who were available in shift through out the trial days. The collected feces were weighed; thoroughly mixed and scrap of representative sample were taken at each collection and put into a plastic bag kept under shade until transported to laboratory. In the laboratory, sample was kept frozen at -20°C. The pooled samples for each animal were thawed, thoroughly mixed and sub sampled. The samples were then dried at 60ºC and kept in air tight plastic bag until analysis was done. Apparent DM and nutrient digestibility of the feeds were calculated using the information from the DM intake, fecal DM out put, nutrient intake and fecal nutrient output [10] and calculated according to the following formula.

$$\text{Apparent dry matter digestibility coefficient} = \frac{\text{DMI-fecal DM output}}{\text{DMI}}$$

$$\text{Apparent nutrient digestibility coefficient} = \frac{\text{Nutrient intake-fecal nutrient output}}{\text{Nutrient intake}}$$

Chemical Analysis: Samples of the feed offered and refused and feces were ground to pass a 1 mm sieve screen using a laboratory mill and were analyzed according to AOAC [11]. The DM of feeds and feces was determined by drying the sample between 95-100°C over night using oven. OM was calculated by subtracting the ash content from the DM. Analysis of neutral detergent fiber (NDF), acid detergent lignin (ADL) and acid detergent fiber (ADF) in feed and fecal samples were performed using the methods of Van Soest and Roberson [12]. Hemicelluloses and cellulose contents were determined by subtracting ADF from NDF and ADL from ADF, respectively. Nitrogen was determined according to the procedure of digesting the sample using Kjeldahl digestion flasks using 10g of mixture of $CuSO_4$ and powdered potassium sulphate, then distillation followed by titration. The CP content was determined by multiplying nitrogen value by a factor of 6.25. The ME was estimated from DOMI as suggested by Beever *et al*. [13].

$$\text{EME (MJkg}^{-1}\text{DM)} = 0.0157\text{*DOMI for digestible nutrient.}$$

Slaughtering Procedures and Carcass Characteristics: At the end of the experiment period, all animals were slaughtered after overnight withdrawal of feed for assessing carcass characteristics. Prior to slaughter, live weight was measured to determine the slaughter weight. Animals were killed by severing the jugular vein and the carotid artery on both sides of the throat. Each carcass was de-skinned, legs trimmed at elbow and all the visceral content removed carefully.

Following slaughtering, weights of blood, skin, head, feet and hot carcass were recorded. Each part of the gastro-intestinal tract was weighed with and without the contents and recorded as edible offal (Liver, heart, rumen, reticulum, omasum, kidney, blood, omentum and kidney fat and small intestine) and non edible offal (Skin, lung with trachea, large intestine, feet, testicles, abomasums, tail, penis, head and gut content). Empty body weight was calculated as slaughter weight minus gut content. Dressing percentage was determined as a percentage of hot carcass weight to slaughter and empty body weight.

Statistical Analysis: Data from the digestibility and feeding trials such as feed intakes, live weight gain and carcass parameters were subjected to analysis of variance (ANOVA) using the General Linear Model of SAS [14]. When treatment effect was found significant, least significant difference (LSD) were employed to detect differences among treatment means. The model used for the digestibility and feeding trials was:

$$\text{Model } Y_{ij} = \mu + \alpha_i + b_j + e_{ij}$$

where
Yij = Response variable
μ = Over all mean
α_i = i^{th} treatment effect
bj = Block effect
eij = Random error

RESULTS AND DISCUSSION

Chemical Composition of the Treatment Feeds: The chemical composition of the treatment feeds is presented in Table 2. The chemical composition of maize stover (MS) used in the present study was comparable to the contents of MS reported by Hirut [15] which were 91.5, 5.8, 86.6, 49.1 and 4.7%, DM, CP, NDF, ADF and ADL, respectively. Where as the organic matter of maize stover reported by the same author is a bit higher than reported by the present study.

The CP content of WB used in the present experiment is comparable with the values of 16.3, 16.5, 16.4 and 16.8% reported by Solomon *et al* [16], Awet [17] and Tesfaye [18], respectively. But it is lower than the report by Asnakew [19] which is 19.55%. On the other hand it was similar with 14.9 % DM reported by Mulat [20] and 14.53 % DM reported by Giril *et al.* [21]. These differences in CP content of WB might be due to variation in raw material (wheat), variety and methods of milling [22].

The CP and DM content of Noug seed cake recorded in the present study is bit lower than that reported by Zewdu [23] which were 34.6 and 93.94%, respectively. The CP content of NSC was comparable with the value of 35.5 and 31.26% reported by Mulat [20] and Abebaw [24] respectively but it was higher than, 28.99 and 29.4 % CP reported by Fentie and Solomon [25]. The difference in CP of NSC might be attributed to the method of oil extraction process and variety of the noug seed used [22].

Table 2: Chemical composition of the experimental feeds

	Treatment Feeds						
	Concentrate mix						
Variables	MS	WB	NSC	T1	T2	T3	T4
DM (%DM)	91.64	87.97	92.03	78.65	88.41	88.69	88.37
ASH (%DM)	6.13	4.78	10.76	6.68	7.44	8.22	8.21
OM (%DM)	85.51	83.18	81.27	82.5	80.97	80.46	80.16
CP (%DM)	5.25	14.88	30.04	23.33	22.75	24.06	23.65
NDF (%DM)	82.25	55.18	41.04	63.63	50.63	69.76	48.33
ADF (%DM)	47.85	13.32	30.64	16.5	17.2	23.4	22.61
ADL (%DM)	4.2	5.6	10.79	4.88	6.18	7.72	7.09
HC (%DM)	34.4	41.86	10.4	47.13	33.43	46.36	25.72
Cellulose (%DM)	43.65	7.72	19.85	11.62	11.02	15.68	15.52

ADF=acid detergent fiber; ADL= acid detergent lignin; CP= crude protein; DM=dry matter; HC= hemi cellulose; MS =maize stover; NDF= nutral detergent fiber; NSC= noug seed cake; OM= organic matter; T1= maize Stover+ concentrate alon; T2= T1+2.6g yeast; T3= T1+3.9g yeast; T4= T1+5.2g yeast; WB= wheat bran.

Table 3: Daily feed dry matter and nutrients intake of hararghe highland bulls fed maize stover and concentrate mix fortified with different levels of yeast (*saccharomyces cerevisiae*)

	Level of Yeast inclusion (g)				
Parameter (Kg)	0 (T1)	2.6 (T2)	3.9 (T3)	5.2 (T4)	SL. SEM
DMIMS	1.96	2.6	2.16	2.32	NS 0.17
DMICF	2.31^{c}	2.64^{a}	2.52^{b}	2.65^{a}	*** 0.04
TDMI	4.27^{c}	5.25^{a}	4.68^{bc}	4.97^{ab}	* 0.18
OMI	4.28	4.88	4.34	4.59	NS 0.16
CPI	0.82	0.86	0.83	0.87	NS 0.02
NDFI	3.86	4.16	4.18	3.81	NS 0.18
ADFI	1.54^{b}	1.92^{a}	1.83^{ab}	1.93^{a}	* 0.09
ADLI	0.38^{b}	0.49^{a}	0.48^{a}	0.49^{a}	** 0.02
ASHI	0.34^{b}	0.41^{a}	0.39^{a}	0.42^{a}	** 0.01
DMI/MBW	0.09	0.1	0.09	0.09	NS 3.75
Digestible Nutrient intake (kg)					
DDMI	2.74	3.25	3.08	2.90	Ns 0.24
DOMI	2.73	3.21	3.09	2.85	NS 0.23
DCPI	0.54	0.58	0.59	0.62	NS 0.02
DNDFI	1.63	2.21	2.04	1.88	NS 0.25
DADFI	0.64	0.92	1.01	0.86	NS 0.14
DADLI	0.16^{b}	0.31^{ba}	0.36^{a}	0.25^{ba}	** 0.24
DMEI	0.04	0.05	0.05	0.05	NS 0.01

[abc] Means in the same row with different superscripts differ significantly; (***)=$P<0.001$; (**)=$P<0.01$; (*):$P<0.05$; ADFI= acid detergent fiber intake; ADLI =acid detergent lignin intake; CPI= crude protein intake; DADL= digestible acid detergent fiber intake; DADFI= digestible acid detergent fiber intake; DCPI= digestible crude protein intake; DDMI=digestible dry matter intake; DMIMS= dry matter of maize stover; DMICF= dry matter intake of concentrate feed; DMEI= digestible metabolisable energy intake; DNDFI= digestible neutral detergent fiber intake; DOMI= digestible organic matter intake; MBW= Metabolic body weight; NDFI= neutral detergent fiber intake; OMI=organic matter intake; TDMI/MBW= total dry matter intake per metabolic body weight; TDMI=Total dry matter intake;

The DM, ASH, ADL and ADF content of the concentrate feed are higher in yeast than the non yeast group (control). While the OM and HC content is higher in non yeast group feed than the yeast group. The CP content of the concentrate feed is higher in T_3 than the rest of the yeast group and the control one. The cellulose content is higher in T_3 followed by T_4.

Feed Intake: Mean DM intake is presented in Table 3. The total DM intake of fattening bulls offered concentrate fortified with (*Saccharomyces cerevisiae)* yeast was significantly higher ($P<0.05$) as compared to that consumed concentrate without yeast. Erasmus *et al*. [26] stated that one of the beneficial effects of the addition of yeast cultures to diets is enhancement of dry matter intake, which agrees with our finding. Feeding yeast culture of the same source increased the palatability of feeds and consequently feed intake [27]. Maize Stover DMI was not significantly different between treatments, although the yeast group consumed numerically more than the non yeast group. Concentrate DM intake was also higher ($P<0.001$) in yeast groups than the control (Non-yeast group). Similar to the present results, some studies indicated that yeast supplementation improved feed intake of diets containing high-forage /low concentrate ration [28].

Bulls supplemented with concentrate ration containing 2.6g and 5.2g of yeast had higher TDMI ($P<0.05$) compared to bulls supplemented with 3.9g of yeast. The lower total dry matter intake in T_3 compared to T_2 and T_4 may be because of individual variation between animal in this treatment, some of which were sick for unknown reason and others refuse consuming yeast containing concentrate. Crude protein and NDF intake did not significantly differ ($P>0.05$) between treatment groups, but, CP and NDF seems to increase numerically in yeast group. The intake of NDF is numerically higher in 2.6 and 5.2 gram yeast group, which is due to high intake of maize stover that has higher NDF. Intake of ADF was significantly higher ($P<0.05$) in T2 and T4 compared to the control and ADL and ash intake was significantly higher ($P\leq 0.01$) in yeast than non yeast groups. Generally, the increase in intake of DM, CP, NDF and ADF, statistically or numerically is a reflection of the addition of yeast in to the diet of cattle.

The trend in dry matter intake is shown in Figure 1. There is a sharp fall in DMI in T2 between 45-60th day of the experiment. The DMI in T_3 and T_4 is relatively constant throughout the experiment period. The DM intake in T1 (Non yeast group) slowly increased but remain lower than the yeast group for most of the time. In general the trend shows high dry matter intake in

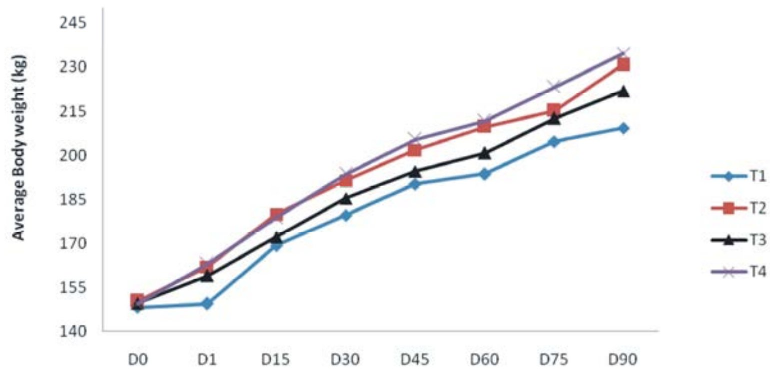

Fig. 1: Body weight change over the period of the experiment in Hararghe highland bulls fed maize stover as a basal diet and concentrate mix fortified with different levels of yeast. D0 = is initial weight; d1 = is end of adaptation period.

Table 4: Dry matter and nutrient digestibility of Hararghe highland bulls fed maize stover and concentrate feed fortified with different levels of yeast *(Saccharomyces cerevisiae*).

	Level of yeast inclusion (g)				
Parameter	(0) T1	(2.6) T2	(3.9) T3	(5.2) T4	SL SEM
DM	0.60	0.59	0.64	0.59	NS 0.03
OM	0.64	0.63	0.69	0.63	NS 0.08
CP	0.69	0.68	0.73	0.72	NS 0.02
NDF	0.52	0.54	0.58	0.51	NS 0.04
ADF	0.41	0.45	0.52	0.43	NS 0.05
ADL	0.39^{c}	0.53^{ab}	0.61^{a}	0.47^{bc}	* 0.04

^{abc} Means with different superscripts in different rows are significantly different; (**):*P*<0.01; ADF= acid detergent fiber; ADL= acid detergent lignin; CP= crude protein; DM= dry matter; NDF= neutral detergent fiber; NS= not significant; OM= organic matter; SD= standard deviation; T1= maize Stover+ concentrate alone; T2= T1+2.6g yeast; T3= T1+3.9g yeast; T4= T1+5.2g yeast

yeast supplemented bulls as compared to the control. The present study is supported by Payandeh and Kafilzadeh [39], Fadel [30] Haddad and Goussous [31] who reported increased DM and nutrient intake in lambs, Nubian Goat Kids and Goat kids, respectively supplemented with variable levels of yeast. The higher total DM intake with yeast supplemented group in the present study was also similar to the result obtained by Erasmus *et al*. [26], Philips and Vontugeln [32] and Wohlt *et al*. [33] who reported a significant effect on dry matter and organic matter intakes of feeder calves, dairy cattle and dairy cows, respectively. Contrary, in sheep no change was recorded in the dry matter intake as the result of yeast addition [34, 35]. Reduced daily feed intakes in dairy cows fed yeast have also been reported [36, 37]. Yeast can result in higher intake through an increase in rumen content outflow rate by improving the fermentation in the rumen [38].

Dry Matter and Nutrients Digestibility: Digestibility of DM and other nutrients of the experimental feeds are presented in Table 4. The apparent digestibility of DM, OM, CP, NDF and ADF were not significantly different (*P*>0.05) between the non yeast and yeast groups, but digestibility of DM, OM, NDF and ADF were better numerically at 3.9g of yeast and that of CP is tended to be significant (P = 0.0645). Similar result is reported by Payandeh and Kafilzadeh [39] dry matter digestibility is significantly increased by yeast addition in lambs. However, yeast did not have any significant effect on apparent digestibility of OM and NDF. Similar to the present result, Paryad and Rashidi [40] reported that *Saccharomyces cerevisiae* yeast supplementation significantly (P < 0.05) increased digestibility of dry matter (DM), organic matter (OM), crude protein (CP) and NDF of tomato pomace at 2 and 4 gram yeast and rams fed 4 gram yeast produced the best digestibility.

Acid detergent lignin digestibility of yeast group was significantly higher (*P*<0.01) in the current study as compared to non-yeast group. This result agrees with that reported by some authors who recorded increased fiber digestion of low quality forages [41], while others [42-44] have not recorded any effect. Another study reported a tendency for increased (*P* = 0.10) DM digestion in the

Table 5: Body weight change of Hararghe highland bulls fed maize stover and concentrate mix fortified with different levels of yeast (*Saccharomyces cerevisiae*)

Parameters	T1 (0)	T2 (2.6g)	T3 (3.9g)	T4 (5.2g)	SL	SEM
IBW (Kg)	148.3	150.4	149.6	149.5	NS	6.81
FBW (Kg)	209.3^{b}	230.8^{a}	221.9^{ba}	234.7^{a}	*	8.33
ADG (g/d)	676.2^{b}	893.3^{a}	801.7^{ab}	948.3^{a}	*	45.22
FCE (gADG/gDMI)	0.16	0.17	0.17	0.19	NS	0.01

[ab] Means with different superscripts in the same row are significantly different; (**)=P<0.01; ADG= average daily body weight gain; FBW=Final body weight; FCR: feed conversion ratio; IBW= Initial body weight; SD= standard deviation; NS= not significant.

Table 6: Carcass parameters of Hararghe highland cattle fed maize stover and concentrate feed fortified with different levels of yeast (*Saccharomyces cerevisiae*)

Parameter	T1 (0)	T2 (2.6)	T3 (3.9)	T4 (5.2)	L.sig	SEM
SBW	207.3	225.8	214.3	224.6	NS	10.52
EBW	178.3	193.4	184.7	191.6	NS	8.89
HCW	106.2	114.8	109.7	115.6	NS	4.89
DPSW	51.3	50.9	51.4	51.7	NS	1.16
DPEB	59.7	59.4	59.5	60.6	NS	1.16

DPEB= dressing percentage of empty body weight; DPSW= dressing percentage of slaughter body weight; EBW=Empty body weight; HCW=hot carcass weight; SBW=slaughter body weight; NS: not significant

group supplemented with yeast culture compared with control, but no effects (P > 0.05) on other nutrient digestibility parameters [9].

Live Weight Gain: Mean initial and final live weight, average daily gain (ADG) weight changes and feed conversion efficiency (FCE) of the experimental bulls on the different treatment feeds are presented in Table 5. The mean body weight gain (829.9g/day) of Hararghe highland bulls in the present study is higher than average daily gain reported by Yoseph *et al*., [45] in Ogaden bulls (503g/day) grazed native pasture and Emebet [46] in yearling Ogaden Cattle which is 395g/day. It is also higher than that reported by Preston and Leng [36] in Ogaden cattle; Abebe *et al*. [6] in Zebu cattle and Yoseph *et al.* [8] which are 740g/d, 710g/d and 650g/d, respectively. Bulls supplemented with concentrate fortified with yeast gained higher body weight ($P\leq$ 0.01) as compared to the non yeast group except T_3 which only tended to be higher than the control. This result agrees with the study of Payandeh and Kafilzadeh [39] who reported higher average daily gain of finishing lambs with no effect on feed conversion ratio. Another study of "A 109" day experiment conducted to determine the performance of beef steers fed a commercial feedlot diet with and without the addition of 0.2% of diet as *Saccharomyces cerevisiae* showed that steers fed with yeast tended to gain more (1.44 vs. 1.26 kg/d) than those fed the control diet" [47].

The Final body weight also significantly higher (P<0.05) in yeast supplemented bulls than the non supplemented bulls. Feed conversion efficiency of bulls was not significantly different (P>0.05) between the group consumed concentrate without yeast and yeast containing concentrate as well as among the later groups (Table 6). Similar to present result, Mutsvangwa *et al.* [48] reported that significant improvements in dry matter intake had no effects on efficiency of feed conversion of intensively fed bulls. Similar results were obtained by other workers, who reported no effect of feeding yeast cultures on feed conversion ratio in fattened bulls [48], in beef calves [29], or finishing lambs [35]. Another study reported that yeast increase average daily gain in growing/finishing cattle, without affecting feed conversion efficiency [18].

The trend in live weight change of bulls over the experimental period is given in Figure 2. The body weight of the experimental animals in all the treatments increased throughout the experiment with more prominent increase in the group consumed concentrate fortified with different levels of yeast. This might be related to the higher feed intake by the groups supplemented with concentrate containing yeast. Numerically higher value of body weight change is recorded in bulls supplemented with concentrate containing 5.2g of yeast followed by that containing 2.6g and 3.9g, respectively. The results in the present study is similar with that reported by Lesmeister *et al*. [49] and Di Francia *et al*. [50] who found higher body weight gain in dairy and buffalo calves, respectively supplemented with yeast culture. While Ramírez *et al*. [51] reported that weight gain was not positively affected by yeast treatment in water buffalo calves in Colombia.

Body Condition Scoring: Logistic regression of body condition scoring did not show significant difference among the treatments (Pr > ChiSq > 0.05 at α = 0.05) (Appendix Table 5). The mean body condition scoring for

Table 7: Weight of major carcass of cattle's fed maize Stover and concentrate feed fortified with different levels of yeast (*Saccharomyces cerevisiae)*

Carcass parts	T1 (0)	T2 (2.6)	T3 (3.9)	T4 (5.2)	L.sig	SEM
Fillo	1.5	1.5	1.4	1.3	Ns	0.10
Back bone	10.2	11	10.7	11.1	Ns	0.36
Lumbar	2.8	3.3	3.1	2.9	Ns	0.23
Fore-quarters	16.3	16	15.4	16.4	Ns	0.99
Hind-quarters	26.3	29.1	26.8	30.2	Ns	1.46
Ribs	16.9	18.8	18.4	18.4	Ns	1.18
Briskets	15.8	17.4	16.9	17.5	Ns	0.83
Loin	13.5	14.2	14.1	15.7	Ns	0.81
Hump	2.9^{ab}	3.5^{a}	2.8^{ab}	2.2^{b}	*	0.3
TUC	106.2	114.8	109.7	115.6	NS	4.89

^{ab} Means with different superscripts in rows are significantly different; (*)=P<0.05; NS= not significant; TUC= total usable carcass

Table 8: Weight of edible offal's of Hararghe highland bulls fed maize stover and concentrates feed fortified with different levels of yeast (S*accharomyces cerevisiae).*

Parameters	T1 (0)	T2 (2.6)	T3 (3.9g)	T4 (5.2)	L.sig	SEM
Edeble offals						
Heart	0.7	0.6	0.72	0.8	Ns	0.05
Liver	3.1	3.0	2.98	3.0	Ns	0.17
Kidney	0.4	0.5	0.41	0.5	Ns	0.02
Reticulo-Rumen	5.1	5.6	5.17	5.5	Ns	0.19
Omasum	1.5^{b}	1.9^{ba}	2.15^{a}	1.9^{ba}	*	0.15
Kideny Fat	1.4	1.4	1.69	1.6	Ns	0.17
Blood	6.0	7.0	7.5	6.7	Ns	0.59
SI	3.4	3.5	3.37	3.2	Ns	0.26
AF	2.2	2.1	2.6	2.1	Ns	0.29
Penis fat	1.1	1.2	1.2	1.3	Ns	0.11
Tongue	0.7	0.7	0.72	0.7	Ns	0.04
Gall.bladder	0.1^{b}	0.1^{b}	0.18^{a}	0.1^{b}	*	0.014
Bladder fat	1.2	1.06	1.07	1.2	Ns	0.11
MM	1.8	2.12	2.37	2.0	Ns	0.19
TEO	29.6^{c}	32.65^{b}	35.15^{a}	34.54^{ba}	***	1.02
Non edible						
Head	10.99	11.63	11.15	11.25	Ns	0.56
Testicle	0.3	0.36	0.33	0.35	Ns	0.03
Abomasum	0.78	0.77	0.63	0.87	Ns	0.09
Tail	0.38	0.51	0.45	0.46	Ns	0.02
LI	2.2^{b}	2.4^{b}	2.45^{b}	3.1^{a}	*	0.22
Gut fill	29.1	32.5	29.5	32.97	NS	2.23
Skin	17	18.6	17.3	19.67	NS	0.8
Feet	4.2	4.38	4.2	4.5	NS	0.21
LWT	3.03	2.82	2.92	2.82	NS	0.19
Spleen	0.64^{b}	0.71^{ba}	0.58^{b}	0.78^{a}	*	0.05
Penis	0.24	0.24	0.56	0.29	NS	0.09
TNEO	69.8	76.87	73.06	81.09	*	3.4

^{ab} Means with different superscripts in rows are significantly different ; (*)=P<0.05; AF= abdominal fat; LI= Large intestine; LWT= lung with trachea; MM= mesenteric muscle; NS= not significant; SI=small intestine; TEO= total edible offal; TNEO = total non edible offal

the treatments ranged between4-7, T_1 and T_4 possesses numerically the lowest and the highest scores, respectively. Similar to the current study, some authors reported that the mean body condition score was the highest ($P \leq 0.05$) in Ogaden bulls grazing native pasture and supplemented with different proportion of agro industrial by products and grass hay [45].

Carcass Component: Mean values of slaughter weight (SW), empty body weight (EBW), hot carcass weight (HCW) and dressing percentage are presented in Table 7. There was no significant difference (P>0.05) between yeast and non-yeast groups of bulls in SW, EBW, HCW and dressing percentage (Calculated on slaughter and empty body weight basis). But, numerically the yeast groups recorded higher value than the non-yeast group.

Similar to the present study Payandeh and Kafilzadeh [39] reported that addition of yeast has no significant effect on carcass components of lambs. Carcass weights and dressing percentage were not also different between the treatment groups.

There was no significant difference (P>0.05) between yeast and non-yeast supplemented bulls in all carcasses except Hump (P<0.05). But numerical increment was recorded in Hind-quarts, Ribs, Briskets, Loin and TUC, which is higher in yeast than the non yeast group. Our result is in agreement with others, who reported no effect of yeast culture supplementation on the carcass traits of growing steers [52] and in buffalo calves [53].

Edible and Non-edible Offal: In the present study, almost all non carcass offal components were not different between yeast group and non yeast group bulls except that the Gall bladder and the TEO were higher in T3 than the rest and T_4 than T_2, respectively (P<0.05, Table 8).

CONCLUSIONS

This research confirmed that productivity, dry mater intake, average daily live weight gain and performance of the animal can be increased through use of yeast in ruminant diet.

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