

Growth Performance and Carcass Characteristics of Horro Sheep under Grain-Less feed Regime: Wheat Bran as Substitute for Maize Grain

Tesfaye Tadesse^{1*}, Milkessa Gelana¹, Tusa Gemechu¹, Birmaduma Gadissa¹, Berhanu Geremew¹

¹Oromia Agricultural Research Institute, Bako Agricultural Research Center, P.O. Box 03, Bako, Oromia, Ethiopia

*Corresponding author: Tesfaye Tadesse, Oromia Agricultural Research Institute, Bako Agricultural Research Center, P.O. Box 03, Bako, Oromia, Ethiopia, Tel: +251925336343; E-mail: tesefu.t@gmail.com

Received date: May 4, 2021; Accepted date: September 2, 2021; Published date: September 12, 2021

Citation: Tesfaye T (2021) Growth Performance and Carcass Characteristics of Horro Sheep under Grain-Less feed Regime: Wheat Bran as Substitute for Maize Grain. J Anim Sci Livest Prod Vol.5 No.4.

Abstract

A total of 27 Horro rams from Bako Agricultural Research Center were used with the main objective of evaluating growth performance and carcass characteristics of Horro rams supplemented with Wheat bran – Noug Cake concentrate. The rams were randomly assigned to three different treatments based on their initial liveweight. The three treatments were: T1= Rhodes grass hay ad lib +Concentrate (69.5% Wheat bran + 29.5% Noug cake + 1% Salt), T2= Rhodes grass hay ad lib + Concentrate (55.5% Wheat bran + 33.5% Noug cake + 10% Maize + 1% Salt), and T3= Rhodes grass hay ad lib + Concentrate (49.5% Noug cake + 49.5% Maize grain + 1% Salt). There was a significant variation in final body weight between T1 and T3, T3 showing a higher final body weight. However, the Least Square Difference of Means (LSD) showed that, there was no significant difference in final body weight between rams in T2 and T3. Similarly, there was no significant difference in final body weight between rams in T1 and T2. The results of this study have showed that total substitution of maize grain with wheat bran resulted in a lower final body weight and average daily weight gain. On the contrary, as a result of variations in price of the concentrate mixtures, the net return value was not significantly varied. So, from the control concentrate mixture which is 49.5% Noug cake + 49.5% Maize grain + 1% Salt, 40% of noug cake and the whole maize grain could be substituted with wheat bran without affecting the crude protein content. Thus, a concentrate mixture of T1 (69.5% Wheat bran + 29.5% Noug cake + 1% Salt) can be used instead of T3 (49.5% Noug cake + 49.5% Maize grain + 1% Salt).

Key words: Growth performance, grain-less, wheat bran, Horro sheep.

Introduction

In Ethiopia, sheep producers target their lambs to attain slaughter weight in a short period of time with the maximum amount of lean meat, minimum bone and an amount of fat which is desired by the consumers (Aschalew and Getachew, 2013). However, FAO (1997) reported that mean carcass weight of sheep is less than 10 kg per animal, which is the second lowest in sub-Saharan African. Gameda et al. (2007) and Tesfa et

al. (2013) suggested that, among many factors, plane of nutrition plays a major role in contributing to the variation in growth performance, carcass weight and carcass compositions in sheep. Temesgen et al. (2007) noted that sheep productivity is based on large flock number, which is not viable option due to growing human population. Instead, intensified feeding may be one way of raising production per unit of animal in a sustainable way, on the basis of utilizing available feed resources as suggested by Shapiro et al. (2004).

The major feed resources in Ethiopia are native pasture, crop residues and agro-industrial by-products. The native pasture, however, is characterized by high seasonal variation in yield and quality and animals often lose condition during the dry season. Grains are expensive and economically not suitable to use as a supplement in animal nutrition. The challenge is to develop alternative feed resources that will sustain production throughout the year.

In feeding systems where straws and hay are the basic diet for ruminants, the low intake of these roughages requires supplementation to meet the requirement for production. The rate of

growth and milk production by ruminants grazing tropical pastures and depending on crop residues or grass hay alone are generally low and about 10% of the animals genetic potential (Leng, 1997). This implies that strategic supplementation of energy; protein and minerals are important means of ensuring better animal performances. The aim of supplementation for ruminants feeding system is to alleviate nutritional deficiencies in the basal diet to maintain or increase intake of the basal diet (McMeniman et al., 1988). When ruminants are offered un-supplemented low quality roughage, they lose weight because of their inability to meet both energy and protein requirements (Nsahlai, 1991). Therefore, supplementation with nitrogen either as protein or non- protein nitrogen and energy has been shown to improve animal performances, mainly through increasing DM digestibility, intakes and balances of nutrients (Preston and Leng, 1987). Rates of fermentation of fibrous crop residues can often be improved by supplementing small amount of highly digestible protein and energy nutrients such as agro-industrial by-products (Leng and Preston, 1983).

Therefore, this study was intended with the general objective of evaluating growth performance and carcass characteristics of

Horro rams fed grain-less supplemental feed and determining the economic feasibility of fattening with those non-grain based concentrates.

Specific objectives

To evaluate growth performance and carcass traits of Horro rams supplemented with wheat bran-noug cake concentrate

To identify profitability of wheat bran-noug cake concentrate as compared to maize grain-noug cake concentrate

Materials and Methods

Study site

The study was conducted in Bako Agricultural Research Centre which is located at about 250 km from Addis Ababa on the main road to Nekemte. The area is situated at an altitude of 1650 m.a.s.l. and receives mean annual rainfall of 1200mm in a bimodal distribution, 80% of which falls from May to September. Bako area had a mean relative humidity of 60% and mean minimum and maximum temperatures of 13.5°C and 27°C, respectively.

Animals and experimental design

A total of twenty seven yearling Horro rams with mean initial body weight of 24.9 + 0.21 kg, with a range of 20.0 + 0.45 kg to 29.8 + 0.32 kg have been used for this study. The experiment was laid out in completely randomized design (CRD) with three treatment groups. All the twenty seven animals were sorted in ascending initial body weight and then stratified to three weight groups each consisting of nine animals. The randomization was done by randomly assigning the nine animals in the first strata to the three treatment groups, thus each treatment received three animals from the first strata and the same was done for the second and the third strata. Finally, the three treatment groups had nine animals each. All the rams were housed in individual pens throughout the experimental period.

The three dietary treatments were:

T1= Rhodes grass hay ad lib + (69.5% Wheat bran + 29.5% Noug cake + 1% Salt),

T2= Rhodes grass hay ad lib + (55.5% Wheat bran + 33.5% Noug cake + 10% Maize + 1% Salt),

T3= Rhodes grass hay ad lib + (49.5% Noug cake + 49.5% Maize grain + 1% Salt).

Each animal received 400g per day of their respective feed for 90 days with adaptation period of two weeks.

Carcass analysis

At the end of the 90 days experiment, all sheep were fasted overnight, weighed and slaughtered. Different components of the carcass were separated, weighed and recorded for each sheep.

The rib eye muscle area was traced between the twelfth and thirteenth rib and the area was measured with traced square paper.

Empty BW was calculated as slaughter weight less gut content. Dressing percent was calculated as proportion of hot carcass weight to slaughter weight and/or empty BW.

Percent of total edible offal (TEO) was calculated as the sum of blood, lung, trachea, heart, liver, spleen, empty gut, kidney and internal fat (mesenteric and kidney) weight to slaughter weight. Also percent of total non-edible offal (TNEO) was calculated as the sum of head, skin, genital organs, gall bladder and gut fill weight to slaughter weight

Data analysis

The GLM procedure of SAS was used to analyse all the data. Treatment means were separated by least significant difference test (LSD).

The model fitted to compute the responses was:

$$y_i = \mu + t_i + e_i$$

Where; y_i = response variable,

μ = overall mean effect

t_i = i th effect of the three feed treatments

e_i = i th effect of random error

Results and discussions

Carcass parameters

The regression analysis of the major carcass traits had shown a strong ($P < 0.001$) relationship with slaughter weight (SW) of all the rams. As a result, there were significant variations ($P < 0.05$) observed in EBW, HCW, DPSW, DPEBW and REMA among rams in T1 & T2 and T2&T3. However, the variations between T1 and T2 as well as between T2 and T3 for all parameters were not significant ($P > 0.05$), except for the variation in REMA between T1 and T2 which was significant. Rib-eye muscle area is mostly used as a tool to indicate the proportion of carcass lean or an expression of carcass desirability (Wolf et al., 1980). In this regard, supplementation appeared to impart better carcass quality characteristics.

There was no significant variation ($P < 0.05$) in DPEBW between rams fed on T1 & T2 as well as between those fed on T2 and T3. However, there was a significant variation in DPEBW between rams fed on T1 (51.68 + 2.9) and T3 (54.44 + 2.9). According to Devendra and Burns (1983), dressing percent helps to assess the meat production capacity of animals. In this study, the higher DPEBW was obtained as a result of higher energy content of maize grain in T3 diet. Since all the treatment feeds were subjected to iso-nitrogen, the variation was not as a result of CP (crude protein) content. Similar results were reported by Field (1971) and Mahgoub and Lodge (1994b). The later authors reported that higher growth and carcass composition differences could be obtained when animals are fed on high energy diets.

Parameter	T1	T2	T3	SEM	SL
SW (kg)	31.89b	33.17ab	34.89a	2.89	*
EBW (kg)	26.24b	27.06ab	29.19a	2.89	**
HCW (kg)	13.56b	14.38ab	15.89a	1.5	**
DPSW	42.52b	43.35ab	45.54a	2.3	**
DPEBW	51.68b	53.14ab	54.44a	2.9	**
REMA (cm ²)	8.97b	9.99a	10.37a	0.63	**

Table 2: Carcass characteristics of Horro rams fed on the three experimental diets.

a,b,c Means with the same letter in the same row are not significantly different, * $P < 0.05$, ** $P < 0.01$, SW: slaughter weight; EBW: empty body weight; HCW: hot carcass weight; REMA: rib-eye muscle area; SEM: standard error of mean; SL: significance level.

Partial budget analysis

In this analysis labor cost was not considered for all the treatments as it is almost uniform for all the three treatments. Actual feed price was taken at the time the experiment was conducted. Similarly, purchase price and selling price of the rams was estimated based on the current market price at the beginning and end of the experiment, respectively. There was a considerable variation in total variable cost among the three groups. Thus T1 showed the smallest total variable cost and T3 the highest. However, due to the higher final body weight, rams in T3 resulted in a slightly higher selling price, even though the variation in net return was not significant.

Variables	Treatments		
	T1	T2	T3
Sheep purchase price (ETB/head)	1750	1753.33	1748.89
Total concentrate cost (ETB/head)	281.16	307.8	413.64
Total variable cost (ETB/head)	281.16	307.8	413.64
Sheep selling price/estimate (ETB/head)	2655.56	2683.33	2800
Total return (ETB/head)	905.56	930	1051.11
Net return (ETB/head)	624.4	622.2	637.47

Table 3: Partial budget analysis of Horro rams fed on the three experimental diets.

T1= 69.5% Wheat bran + 29.5% Noug cake + 1% Salt, T2= 55.5% Wheat bran + 33.5% Noug cake + 10% Maize + 1% Salt, and T3= 49.5% Noug cake + 49.5% Maize grain + 1% Salt

Conclusion

From the current study it was observed that total substitution of maize grain with wheat bran resulted in a lower final body weight and average daily weight gain. On the contrary, as a result of variations in price of the concentrates' ingredients, the net return values were not significantly varied. So, wheat bran could substitute the whole maize grain and up to 40% of noug cake from the previously recommended concentrate feed (49.5% Noug cake + 49.5% Maize grain + 1% Salt) without affecting the crude protein content of the feed.

Therefore, utilization of a concentrate mixture comprising 69.5% Wheat bran, 29.5% Noug cake and 1% Salt could be more economical for fattening of Horro rams as compared to the previously recommended concentrate feed.

References

- Aschalew A, Getachew A (2013) Supplementation of Raw, Malted and Heat Treated Grass Pea (*Lathyrus Sativus*) Grain on Body Weight Gain and Carcass Characteristics of Farta Sheep. *Int J Soil Crop Sci* 1: 1-6.
- Tesfa G, Tegene N, Girma A, Arth L G (2013) Effect of supplementing grazing Arsi-Bale sheep with molasses-urea feed block on weight gain and economic return under farmers' management condition. *J Cell Biol* 7: 125-131.
- Wolf BT, Smith C, Sales DI (1980) Growth and carcass composition in the cross bred progeny of six terminal sire breeds of sheep. *Journal of Animal Production* 31: 307-313.
- Preston TR, Lengs RA (1987) Matching ruminant production system with available resources penambul books Armidate press, Australia Armidal. 245p. Restriction on carcass and non-carcass components, digestibility and subsequent compensatory growth in lambs. *Animal Production* 56: 93-100.
- Field RA (1971) Effects of Castration on Meat Quality and Quantity. *J Anim Sci* 32: 849-858.
- Leng RA, Preston TR (1983) Nutritional Strategies for the utilization of agro industrial by products by ruminants and extension of the principles and technology to small-scale farmer to Asia: proceeding of world conference on animal production 310-318.
- Leng RA (1997) Tree foliage in ruminant nutrition FAO Animal Production and health paper number 139, FAO (Food and Agricultural organization) Rome, Italy.
- Mahgoub O, Lodge GA (1994b) Growth and body composition of Omani Local sheep. Growth and distribution of musculature and skeleton. *Anim Prod* 58: 373-379.
- McMeniman, Elliott NPR, Ash AJ (1988) Supplementation of rice straw with crop-byproducts, legume straw supplementation. *Animal feed science and technology* 19: 43-55.
- Moharrery A, Khorvash M, Khadivi H (2012) Effect of dietary energy level and docking on carcass characteristics of fat tailed Kurdi sheep. *Iran J Livest* 1: 19-27.
- Nsahlai IV (1991) The effects of quantity and quality dietary nitrogen upon straw utilization by steers PhD. Thesis University of reading, UK.

12. Shapiro BL, Mohamed MA, Reynolds L (2004) Socio-economic constraint to strategic sheep fattening. International Livestock Center for Africa (ILCA), Addis Ababa, Ethiopia.
13. Temesgen J, Gameda D, Ketama D, Diriba G (2007) Evaluation of cow pea hay (*V. unguiculata*) vs. noug cake supplementation of *Cynodon dactylon* on growth performance and carcass characteristics of Horro rams. Proceeding of the 11th Annual Conference of the Ethiopian Society of Animal Production (ESAP), Addis Ababa, Ethiopia. 23-29.
14. Yagoub YM, Babiker SA (2008) Effect of dietary energy level on growth and carcass characteristics of female goats in Sudan. *Skin* 6: 6.