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Full Length Research

Performance response of feedlot Bunaji bulls to dietary melon seed husk meal inclusion

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ABSTRACT: A 90-day study was conducted to evaluate the performance response of feedlot Bunaji bulls to dietary melon seed husk meal inclusion. Twelve Bunaji bulls aged two years and weighing 105 Kg on the average were randomly divided into four groups of three bulls each and allotted to four dietary treatments in a Completely Randomized Design in which each bull served as a replicate. The experimental diets were formulated using maize offal, palm kernel meal, soya bean haulm, cowpea husk, soya meal, rice offal, melon seed husk, bone ash and table salt. Melon seed husk meal (MSHM) was included in the diets at 0, 5, 10 and 20% corresponding to T_1, T_2, T_3 and T_4 respectively. Elephant grass (forage) and water were offered *ad libitum* while the experimental diets containing the melon seed husk meal were fed at 3.0% body weight of the bulls. Results obtained at the end of the study showed that there were no significant differences (P>0.05) in the initial body weight, average daily supplement intake, average daily forage intake, average daily total feed intake, average daily body weight gain, feed conversion ratio and final body weight. There were significant differences (P<0.05) in the average daily water intake whose values were 13.66, 13.42, 12.47 and 12.26 litres for T_1, T_2, T_3 and T_4 respectively. It was concluded that inclusion of melon seed husk meal in the diets did not exert any deleterious effect on the performance of the feedlot Bunaji bulls. It was recommended that melon seed husk meal can be included up to 10% in the supplementary diets of feedlot Bunaji bulls.

Key words: Bunaji bulls, dietary inclusion, feedlot, melon seed husk meal, performance response.

INTRODUCTION

History relates that in the early days of domestication, man kept animals, using their manure to fertilize crop fields and in turn parts of the crop and crop residues to feed the animals. The dire need to produce enough food to feed the world has set the stage to build on early domestication history and proceed to an advanced stage by carrying out nutritional characterization of crop residues and out rightly incorporating them into animal rations as reliable components. Nigeria's agrarian economy generates great quantities of crop residues annually from crop processing. These crop residues can easily be employed in ruminant feeding given that their lignocellulosic nature satisfies the scabrous requirement of ruminant feed. One of these crop residues is melon seed husk, which is lignocellulosic and generated during vegetable oil extraction from melon seeds (Ogbe and George, 2012; Nyakuma et al., 2016). Melon seed husk has found utility as land fill and erosion control and also has a great potential for bio fuel production (Nyakuma, 2015); its attraction as a feedstuff is emphasised by its reported proximate profile and nutritional attributes (Onwuka, 2005; Ogbe and George, 2012; Ogbe and Alu, 2014; Abdulrazak et al., 2014; Idoko et al., 2014). Use of melon seed husk meal in goat feeding has also been reported (Sanwo et al., 2011).

With industrialization, increase in global human population and awareness on importance of quality feeding, the need to produce food using the most efficient methods is becoming a premium due to possible increase in food demand (FAO, 2006). Thus, cattle feeding by use of crop residues in feedlot is becoming very attractive owing to ease of availability of the crop residues, the comparable low cost of feedlot operations and simplicity of feedlot operation (Bobo et al., 2017). Nigeria produces copious quantities of melon seeds annually. According to Oyibo and Wuanor (2018), processing the melon seeds generate tonnages of melon seed husk which become an environmental hazard in themselves as well as the disposal method (burning). Converting the melon seed husk to the feeding of cattle will help in ameliorating livestock feed shortage thereby enhancing animal performance. Additionally, it will eliminate the environmental hazard attendant upon burning the melon seed husk and enable the melon seed processors to get extra revenue by selling the melon seed husk for cattle feeding. The aim of the study was to evaluate the performance response of feedlot Bunaji bulls to dietary melon seed husk meal inclusion.

MATERIALS AND METHODS

Study site

The study was conducted at the Cattle Unit of the Livestock Teaching and Research Farm of the Federal University of Agriculture, Makurdi. Makurdi is located on latitude 7^0 14^1 N and longitude 8^0 31^1E and a height of 90 meters above sea level in the Southern Guinea Savannah ecological zone of Nigeria. The rainy season spans from May to October, while dry season spans from November to April; mean temperature ranges from 22.3^0C to 33.41^0C while the mean relative humidity is around 64.58% (Ahemen et al., 2011).

Feed inputs

Feed inputs used in the study were obtained from local dealers. The melon seed husk was milled using a blurr mill to reduce the particle size so as to harmonize with the other feed constituents.

Experimental bulls

Twelve Bunaji bull yearlings were purchased from the International Cattle Market, North Bank, Makurdi and taken to the Livestock Teaching and Research Farm, Federal University of Agriculture Makurdi for the study. Each of the bulls was individually identified by ear tagging and allotted a pen measuring 3.6 X 2.5 m (length and width) constructed of wood and roofed with corrugated iron sheets. Before commencement of the study, the bulls were given prophylactic treatments against ecto and endo parasites as outlined below;

1. Tridox® L.A. injection (antibiotic) was administered 1ml/10 kg body weight intramuscularly.
2. Albendazol 2.5% (anti helminthic) was given orally.
3. Samorin ®injection (against Trypanosomiasis) was administered intramuscularly (i/m) at the rate of 2.0 ml per bull.
4. Vita-flash, a multivitamin was administered intramuscularly at the rate of 1.0 ml per 10 kg body weight.
5. Amguard body spray (against ecto parasites) was reconstituted at 15mls / 15.5 litres of water and sprayed topically on the bulls.

Experimental procedure

Four dietary treatments containing varying levels of melon seed husk meal were formulated; having melon seed husk meal included at 0.0, 5.0, 10 and 20%, corresponding to T_1, T_2, T_3 and T_4 respectively (Table 1). The experimental diets were served to the bulls once a day at the rate of 3.0% of their body weights, while fresh forage of elephant grass (*Pennisetum purpureum)* and drinking water were fed *ad -libitum*. The elephant grass was chopped to reduce the length before feeding to the bulls to encourage its intake as well as prevent wastage as the animal would bite off the forage strands from the bulk served. Salt lick was also provided for the bulls. Body weights were taken every 7 days using weighing band, and the body weight gain was determined by the differences between the current weights and the previous weights of the animals. Feed intake was determined daily from the feed offered and leftover collected i.e. separately for both the supplement and forage and then the total feed intake. Water intake was determined by the difference between the quantity offered and the quantity left. Feed Conversion Ratio (FCR) was calculated as the ratio of feed intake to live weight gain i.e. FCR=Total Feed intake (Kg)/Total Weight gain (kg).

Experimental design

The study was conducted using the Completely Randomized design.

Nutrient analysis

Proximate and fibre fractions analysis of the melon seed husk meal and experimental diets were performed using procedures of AOAC (1990) and Van Soest et al. (1991) respectively. Sodium and potassium were determined by flame photometry, Phosphorus content by Vando-Molybdate method (AOAC, 1990), calcium, magnesium and iron by atomic absorption Spectrophotometry. The various anti nutritional factors were determined by the methods indicated below: Tannin by the method of Makkar and Goodchild (1996), saponin by Obadoni and Ochuku (2001) method, oxalate by Balogun and Fetuga (1988) method, phytates by Peng et al. (2009) method, trypsin

Table1. Experimental diets containing melon seed husk meal fed to feedlot Bunaji bulls (% DM).

Feed Input	T_1	T_2	T_3	T_4
Maize offal	30.00	30.00	30.00	30.00
Soy bean haulms	10.00	10.00	10.00	10.00
Cowpea husk	10.00	10.00	10.00	10.00
Palm kernel meal	20.00	15.00	10.00	0.00
Melon seed husk meal	0.00	5.00	10.00	20.00
Soy bean meal	14.00	14.00	14.00	14.00
Rice offal	12.00	12.00	12.00	12.00
Bone ash	3.00	3.00	3.00	3.00
Salt	1.00	1.00	1.00	1.00
Nutrient composition				
Dry matter	87.57	86.10	97.36	97.69
Crude protein	18.44	18.21	17.90	17.15
Crude fibre	21.80	22.91	23.12	24.65
Ether extracts	5.06	4.69	4.19	3.64
Ash	13.94	13.02	12.61	8.98
Nitrogen free extracts	40.76	41.17	42.18	45.58
Neutral detergent fibre	49.88	51.98	52.66	56.86
Acid detergent fibre	31.42	32.75	33.18	35.82
Acid detergent lignin	4.09	4.26	4.32	4.66
Hemicellulose	18.46	19.23	19.48	21.04
Cellulose	27.33	28.49	28.86	31.16
ME (Kcal/Kg DM)	2530.88	2468.38	2778.65	2853.68

DM = Dry matter, ME = Metabolizable energy.

inhibitor by Shang et al. (2016) procedure, and Cyanogenic glucosides by the procedure of Bradbury et al. (1991).

Data analysis

Data collected were analyzed using Analysis of Variance (ANOVA) package of Minitab Statistical Software (1991), and significant differences in means were separated using Duncan's Multiple Range Test as outlined by Steel and Torrie (1980).

RESULTS

Experimental diets' nutrient profile

The formulae and nutrient composition of the experimental diets are shown in Table 1. The dry matter, crude fibre, nitrogen free extracts, neutral detergent fibre, acid detergent fibre, acid detergent lignin, hemicellulose and cellulose contents of the experimental diets increased with increasing dietary melon seed husk meal inclusion while the crude protein, ether extracts and ash contents decreased with increasing dietary melon seed husk meal inclusion. The proximate, mineral and anti-nutrient compositions of the melon seed husk meal used in the study are shown in Table 2.

Performance indices

The performance response of the bulls is shown in Table 3. In general, the result showed that dietary melon seed husk meal inclusion exerted significant effect ($P<0.05$) only on daily water intake while the other performance parameters were not significantly ($P>0.05$) affected. The average daily supplement intake ranged from 3.67 to 4.71; dietary melon seed inclusion generally caused reduction in supplement intake. Average daily forage intake values were lowest in T_1 and highest in T_2. Total daily feed intake reduced with increasing levels of dietary melon seed husk inclusion; the lowest value was obtained for T_4 and the highest value for T_2. Dietary melon seed husk inclusion increased daily body weight gain in T_2 and T_3 but caused reduction in T_4. Daily water intake was significantly ($P<0.05$) affected by dietary melon seed husk meal such that highest value was obtained for T_3 which was similar to T_1, both of which were superior to T_2 and T_4. Dietary melon seed husk meal inclusion did not exert any significant effect on the feed conversion ratio; values were highest in T_4 and lowest in T_1 and showed that the inclusion

Table 2. Nutrient and anti-nutrient composition of melon seed husk meal.

Component	Amount
Proximate (%):	
Dry matter	99.27
Crude protein	14.50
Crude fibre	26.70
Ether extracts	5.20
Ash	10.37
NFE	43.23
Energy (Kcal/Kg)	2855.61
Minerals	
Calcium (%)	2.45
Magnesium (%)	0.38
Potassium (%)	1.25
Sodium (ppm)	309.55
Iron (ppm)	75.26
Phosphorus (ppm)	23.10
Anti-nutrients (%):	
Tannin	14.05
Saponin	0.88
Oxalate	0.75
Phytates	2.55
Trypsin inhibitor	2.06
Cyanogenic glucoside	0.10

NFE= nitrogen free extracts; Energy was calculated using the formula of Carpenter and Clegg (1956).

Table 3. Performance of feedlot Bunaji bulls fed diets containing melon seed husk meal.

Parameter	T_1	T_2	T_3	T_4	SEM	LOS
IBW (kg)	105.67	106.67	108.00	103.67	6.95	NS
ADSI (Kg)	4.71	4.03	3.93	3.67	0.80	NS
Av. FI (kg)	6.12	6.15	6.14	6.14	0.80	NS
TFI (kg)	10.13	10.16	10.06	9.80	1.37	NS
DBWG (kg)	0.60	0.69	0.62	0.57	0.42	NS
MDWI (ml)	13.66^{a}	13.42^{a}	12.47^{b}	12.26^{b}	0.55	*
FCR	16.51	16.56	17.42	28.35	5.77	NS
FBW (kg)	163.67	161.33	159.33	145.00	13.45	NS

IBW= Initial body weight; ADSI= Average daily supplement intake; Av= average; FI= Forage intake; TFI= Total feed intake; DBWG= Daily body weight gain; MDWI= Mean daily water intake; FCR= Feed conversion ratio; FBW= Final body weight.

increased the feed conversion ratio profile. Final body weight values were highest in T_1 followed by T_2, then T_3 and finally T_4 portraying a trend of decrease with increasing dietary melon seed husk meal inclusion.

DISCUSSION

The increase in the dry matter, crude fibre, nitrogen free extracts, neutral detergent fibre, acid detergent fibre, acid detergent lignin, hemicellulose and cellulose of the treatment diets as melon seed husk meal inclusion increased may be attributed to the fact that the melon seed husk meal had more of these components. Likewise, reduction in crude protein, ether extracts and ash contents of the diets as dietary melon seed husk meal increased is explained on the basis that the melon seed husk meal had less of these components.

Supplement intake reduced as dietary melon seed husk meal increased; this was attributed to increase in crude fibre as dietary melon seed husk inclusion intensified. This was probably caused by the fact that the melon seed husk meal had more crude fibre. This is also supported by the fact that that the control diet (T_1) which had no melon seed husk meal inclusion had lower crude fibre and fibre fractions than the diets in which melon seed husk meal was included.

Daily forage intake increased as melon seed husk meal inclusion increased. This increase was noted to be a direct response to the reduced supplement intake. It was reasoned that due to reduced supplement intake, the experimental bulls increased forage intake, an action necessary to enable sufficient feed intake to ensure adequate nutrient availability needed for metabolic activities of the bulls.

The lack of significance in daily total feed intake agrees with the works of other authors with Bunaji bulls (Oyibo and Wuanor, 2018; Wuanor et al., 2015; Wuanor et al., 2018). This pattern of result is not unexpected because factors affecting feed intake include feed availability, feed quality and feed management (QLG, 2018). In this study, the availability of the feeds was uniform across dietary treatments. More so, feed intake is conditioned by factors including physiological status, body weight, sex, disease, feed palatability, physical form as well as chemical composition of the feed (Quizlet, 2018). This assertion applies well to this study because the bulls were of similar physiological status (growing), they had averagely similar body weights, were of same sex (male), were not attacked by disease during the course of the study, the physical form of the feeds were the same (mash supplement and chopped forages) and their chemical composition did not vary widely. The total feed intake values compare favourably with those reported by Oyibo and Wuanor (2018) who also worked with Bunaji bulls in same environment.

The daily body weight gain values recorded in the study were reasoned to be caused by similarity in daily supplement, forage and total feed intakes because it is the feed intake that accounts for body weight gain. These values are lower than those reported by other researchers who worked with Bunaji bulls in Nigeria (Ikhatua and Olayiwole, 1982; Lamidi et al., 2007; Bobo et al., 2017) but notice is also taken of differences in locations, seasons and age of bulls in present study compared to the other studies.

The water intake values, generally decreased as melon seed husk meal inclusion increased were reasoned to be a response to crude protein content of the treatment diets which decreased with increasing melon seed meal inclusion. It has been reported that in the process of protein digestion, water is required (Wuanor et al., 2015); thus it is expected that high protein quantity would necessitate high water intake, necessary for the protein digestion and vice versa. Additionally, the mineral contents of the diets also decreased with increasing melon seed husk meal inclusion. Water is needed during mineral metabolism in the body to maintain the required isotonic balance. So, a combination of crude protein and dietary ash composition could have caused the water intake pattern recorded. Factors affecting water intake of cattle have been listed to include dry matter intake, environment, shelter and thermal heat stress (McDonald, 2012). In this study, the dry matter intake of the bulls would have been similar due to lack of significant differences in supplement, forage and total feed intakes; the bulls were housed in same environment and shelter and effect of thermal heat stress on them would have been equal. The values of daily water intake recorded in this study are lower than reports of Bobo et al. (2017) but comparable to those of Oyibo and Wuanor (2018).

Similarity in feed conversion values compare favourably with the reports of Bobo et al. (2017) who reported values ranging from 18.51 to 28.61 when Bunaji bulls were fed in feedlot with agro by-products supplemented with concentrate and those of Oyibo and Wuanor (2018) who also fed diets including melon seed husk meal to Bunaji bulls. The non-significance of the experimental diets on FCR is attributed to the lack of significance in values of feed intake and body weight gain, because FCR is a measure based on feed intake and body weight gain.

Conclusion and recommendation

Based on the results obtained from the study, it could be concluded that dietary inclusion of melon seed husk meal did not negatively affect performance of the feedlot Bunaji bulls. It is therefore recommended that farmers engaging in feedlot fattening of Bunaji bulls could include melon seed husk meal up to 10% in the supplemental diets of the bulls.

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