

Acceptability And Growth Performance Of West African Dwarf Rams Fed Basal Diet Supplemented With Graded Energy Levels Of Concentrate Mix

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Abstract

The study was conducted to investigate the acceptability and performance characteristics of West African dwarf rams fed basal diet supplemented with graded level of concentrate mix. Twenty five (25) West African Dwarf rams of average weight of 15.01 ± 0.5 kg were allotted into five dietary treatments in a Completely Randomized Design. The experiment lasted for 14 weeks. The rams were fed with basal diet (*Pennisetum purperum*) supplemented with concentrates at 2600 kcal/kg, 2400kcal/kg, 2200 kcal/kg, 2000 kcal/kg and 1800 kcal/kg as treatments 1, 2, 3, 4, and 5 respectively. Free choice of intake was determined by cafeteria method using two indices; Coefficient of Preference (CoP) and Percentage preference (Pp) while for the growth performance study, animal were randomly allotted to the five dietary treatments where feed intake, weight gain, and feed conversion ratio were determined. The result revealed that the free choice intake of the diet (135.38-305.23 g/day) was significantly ($p<0.05$) influenced by the dietary treatments. The concentrates with energy levels of with 2600kcal/kg (T_1) and 2400kcal/kg (T_2) were inferred acceptable as CoP above unit (1.07 and 1.04) but were not significantly ($p>0.05$) different among other treatments. The highest percentage (16.57) was recorded with rams fed diets with energy level of 2600kcal/kg *Pennisetum purperum* (Treatment 1) was ranked first (1st). The feed intake ranged from 580.98 to 642.56g/day which was not significantly ($p>0.05$) different. Rams fed diet supplemented 2600kcal/kg/day energy level with *Pennisetum purperum* also recorded the highest daily weight gain (77.86 g/day) which was significantly ($p<0.05$) different across the treatments. The metabolic weight gain (2.89- 4.08 $W^{0.75}$ g/day) were significantly ($p<0.05$) different among the treatments. It was therefore concluded from this study that basal diets (*Pennisetum purperum*) supplemented at 2600kcal/kg/day was best accepted, preferred and exhibited the best feed conversion ratio without any adverse effect on the West African Dwarf rams.

Keywords: Acceptability, basal, diets, concentrate, weight gain, intake, coefficient

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I. Introduction

Small ruminant production is an important agricultural activity and has a substantial contribution to smallholder farmers in generating income and securing food in developing countries (Kosgey *et al.*, 2006). Maximization of livestock productivity in the tropical region largely depends on the efficiency of utilization of locally available protein sources (Kaya *et al.*, 2006; Gul *et al.*, 2010). Concentrate feed resources especially grains are expensive and highly valued as human food. Therefore, it is imperative to look for other cheap and alternative feedstuffs to sustain and improve ruminant productivity. Elephant grass is a very important forage in the tropics due to its high productivity. It is particularly suited to feed cattle and buffaloes. Elephant grass is mainly used in cut-and-carry systems ("zero grazing") and fed in stalls, or made into silage or hay. Elephant grass can be grazed, provided it can be kept at the lush vegetative stage: livestock tend to feed only the younger leaves (FAO, 2007). Elephant grass, as implied by its name, is an important source of forage for elephants in Africa (Yusuf *et al.*, 2013).

The limitation in the quality of forages most especially during dry season and increasing in the demand for animal product require supplementing their diet with adequate and balanced ration (Akinwande *et al.*, 2017). It becomes necessary to research on the optimum graded energy levels of concentrates that will promote better growth performance and well accepted by the animals.

II. Materials And Methods

The experiment was carried at the small ruminant unit of Institute of Agricultural Research and Training, (IAR&T), Southern Farm, Moor Plantation Ibadan in South-west part of Nigeria. The area lies within the rain forest ecological zone and falls within longitude and latitude 7°-27° N and 5°-3°E respectively at 200-300m above the sea level with an average rain fall of about 1250mm/Hg. The experiment was conducted in line with the Animal Welfare Ethics Laws Federal College of Animal Health and Production Technology, Ibadan Nigeria. The experiment lasted for a period of sixteen (16) weeks. Twenty-five (25) West African Dwarf rams were purchased from a reputable market in Ibadan and each animal were allotted into each pen which were disinfected and fumigated three (3) weeks before their arrival. The rams were acclimatized for a period of two weeks, the animals were balanced for their weight and allotted into five dietary treatments

Fresh Elephant grass of *Pennisetum Purpureum* was harvested from the College and its environment and allowed to wilt overnight before feeding the animals. Fresh Elephant grass of *Pennisetum purpureum* was harvested from the College and its environment and allowed to wilt before feeding the animals.

Acceptability study

A cafeteria was carried out at the beginning of the experiment to determine their acceptability of the concentrate mixed. It was determined by two ingesta methods namely; co-efficient of preference (CoP) and percentage preference (Pp). 4kg of each diet were replicated into fifteen (15) different trough representing three (3) troughs per treatment, it was then placed at different locations and repeated for seven (7) consecutive days. The location of the trough was changed daily, the animals were allowed to feed on a free choice diet four (4) hours per day. The left-over was weighed to know the accepted feed choice intake

Data Analysis

All data collected were subjected to Analysis of Variance (ANOVA) and significant means among variables were separated using Duncan's Multiple Range Test (SAS).

Table 1: Gross composition of graded energy levels of concentrate mix supplemented to basal diet for West African Dwarf rams

METABOLIZABLE ENERGY (kcal/kg)

Ingredient (%)	2600	2400	2200	2000	1800
	T1	T2	T3	T4	T5
Maize	10.00	6.00	2.00	0.00	0.00
Corn bran	8.00	8.00	10.00	10.00	10.00
Palm kernel cake	20.00	20.00	19.00	20.00	21.00
Groundnut cake	10.00	12.00	13.00	14.00	15.00
Molasses	10.00	10.00	10.00	10.00	10.00
Cowpea husk	5.00	5.00	5.00	5.00	5.00
Soya bean husk	10.00	10.00	10.00	10.00	10.00
Rice bran	20.00	22.00	24.00	24.00	22.00
Limestone	4.00	4.00	4.00	4.00	4.00
Bone meal	2.00	2.00	2.00	2.00	2.00
Salt	0.50	0.50	0.50	0.50	0.50
Grower premix	0.50	0.50	0.50	0.50	0.50
Total Calculated analysis	100.00	100.00	100.00		
Matabolizable E (kcal/kg)	2600	2400	2200	2000	1800
Crude protein (%)	15.20	15.22	15.24	15.21	15.22

III. Results And Discussion

Results

Table 2 shows the Performance characteristics of West African Dwarf rams fed basal diet. Elephant grass (*Pennisetum purpureum*). Supplemented with concentrates of graded energy levels. The weight gain was significantly influenced ($P<0.05$) by the dietary energy intake. It ranged from 4.13kg to 6.54kg in which rams in Treatment 1 (6.54kg) was observed to be the highest value while Treatment 5 (4.13kg) was observed to be the lowest value. The daily weight gain was also significantly different ($P<0.05$) across the treatments which ranged from 49.13g/day to 77.86g/day. The highest value of average daily weight gain was recorded at T₁ (77.86g/day) while the lowest value was recorded in T₅ (49.13g/day). The metabolic weight gained ranged from (2.89 to 4.08 W^{0.75}g/day). The best Feed Conversion Ratio of 7.46 was recorded at T₁ (2600kcal/day) which was significantly affected ($P<0.05$) by different energy levels the lowest Feed Conversion Ratio was recorded at the rams fed basal diet supplemented with 2600Kcal/kg energy level while the highest Feed Conversion Ratio was observed at the rams feed basal diets supplemented with 1800Kcal/kg energy level.

Table 2: Performance Characteristics of West African Dwarf ram fed basal diet supplemented with concentrate mix of graded energy levels.**METABOLIZABLE ENERGY**

Parameter	2600 A	2400 B	2200 C	2000 D	1800 E	SEM
Initial weight (kg)	14.95	14.92	14.98	15.01	15.19	0.92
Final weight (kg)	21.49	20.79	19.92	19.49	19.31	0.39
Weight gain (kg)	6.54 ^a	5.86 ^{ab}	4.94 ^{bc}	4.49 ^c	4.13 ^c	0.12
Daily weight gain (g/day)	77.86 ^a	69.82 ^{ab}	58.85 ^c	53.41 ^c	49.13 ^c	0.12
Metabolic weight gain (w^{0.75})	4.08 ^a	3.77 ^{ab}	3.32 ^{bc}	3.081 ^c	2.89 ^c	0.10
Dry matter grass intake (g/day)	333.13	355.10	345.74	332.67	324.85	0.66
Dry matter concentrate (g/day)	247.85	263.63	296.81	278.38	306.37	0.18
Total dry matter (g/day)	580.98	618.74	642.56	611.04	631.22	0.41
Feed conversion ratio	7.46 ^c	8.91 ^{bc}	10.91 ^{ab}	11.63 ^{ab}	12.86 ^a	0.33

a,b,c means of different superscripts along the same row are significantly different (p<0.05).

Table 3 shows the acceptability of concentrates mix supplemented for basal diet (*Pennisetum purpureum*) fed to West African dwarf rams. The free choice intake was significantly influenced (P<0.05) by the supplementation of different energy levels. Rams fed with 2600kcal/kg energy level recorded the highest free choice intake (305.23g/day) while the lowest free choice intake (135.38Hg/day) was observed with rams fed basal diet supplemented with 1800kcal/kg energy level. No significant different (P<0.05) was recorded for another index (coefficient of preference) it ranged from 0.98 to 1.07. Marked significant different (P<0.05) was recorded at the Percentage Preference (Pp), the highest Pp was observed at treatment fed with 2600kcal/kg energy level while lowest value found for rams fed with 1800kcal/kg. The ranking order followed the decreasing order of energy level. First ranking was recorded for rams fed basal diet supplemented with 2600kcal/kg while least ranking (5th) was observed at treatment 5.

Table 3: Acceptability of Concentrate mix of graded energy levels by West African Dwarf rams

Parameter	T1	T2	T3	T4	T5	SEM
Feed choice intake (Hg/day)	305.23 ^a	240.53 ^a	197.70 ^b	167.70 ^b	135.38 ^c	0.27
Coefficient of preference (CoP)	1.07	1.04	1.01	0.99	0.98	0.67
Percentage Preference (Pp) (%)	16.57 ^a	14.50 ^b	14.24 ^b	14.23 ^b	14.12 ^b	0.30
Ranking	1 st	2 nd	3 rd	4 th	5 th	

a,b,c means of different superscripts along the same row are significantly different (p<0.05).

Discussion

Preference assessment otherwise called acceptability is a fast and cheap means of accessing diets or folder plants in a short period of time Scandoval- Castrol *et al.* (2005). The free choice intake observed in this present study was in line with the 520.48-570.75g/kg reported by Ososanya and Olorunisomo (2015) who fed West African Dwarf rams with wet brewer's dry grain ensiled with maize cob. The acceptability of the diet can be determined using two indices; Coefficient of Preference (CoP) and percentage preference (Pp); Coefficient of Preference which is the ratio of intake, the different forages/ diets to the average intake of forages diet. Diet is prepared to be relatively acceptable when the (CoP) is equal to or greater than unity (Babayemi and Bankole, 2006). The Coefficient of Preference (CoP) recorded in this study ranged from 0.98-1.07, within the range reported by Ososanya and Olorunisomo (2015) of CoP 0.84-1.33. It is also within the range reported by Qdugwa *et al.* (2013) who gave the CoP of 0.49- 2.30. When the coefficient of Preference (CoP) is equal to or greater than 1 the diet is considered to be acceptable and when CoP is less than 1, the diet is assumed to be less or unacceptable to the livestock. Olorunisomo and Fayomi (2012) noted that Coefficient of Preference (CoP) may not be realistic measure of acceptability of diets by ruminants since it does not take into consideration the previous experience of the animals or the relative importance of changing the dietary preference of livestock. Abegunde *et al.* (2017) also reported CoP of (0.37-1.44) for West African Dwarf goats fed mombin leaves fruit silage; the percent preference reported as (9.18-35.26%) which was within the range (14.12-16.57%) recorded in this study. The highest percentage preference (Pp) of 16.57 was recorded with the highest free choice intake of 305.23g/day *Pennisetum purpureum* with the similar trend CoP. (Ikhimoya and Imaseun, 2007) reported that small ruminants given a particular diet influencing their choice among variety of feeds. The potential of *Pennisetum purpureum* due to its pungency to increase dry matter intake by changing the intake pattern has been demonstrated by Cell and Chauban (2013). Similar reports of plant extract pungency also demonstrated by Abdurahman *et al.* (2019) showed that dry matter intake (DMI) was increased by a blend of cinnamal-dehyde and eugenol in the diets of primiparous cows and growing ewes respectively. The total daily dry matter intake values of experimental animals fed diets containing *Pennisetum purpureum* obtained in this study is in agreement with the range for total feed intake (601.87 to 628.56g/day) obtained by Likawent *et al.* (2012) on the evaluation of *Piliostigma reticulatum* pod meal on sokoto bucks. It is also in line with the another finding of Likawent *et al.* (2012) who reported a range of

610- 678g/day for Washera rams fed on natural pasture hay as basal diet. However, there was a shortfall as compared to the values obtained by Ososanya *et al.* (2010) who reported average total dry matter intake of 528.21 and 534.68g/day for West African dwarf lambs fed diets containing varying levels of broiler litters respectively. All the observed values of feed intake were within the recommended daily feed intake of ruminants (3-4%DM body weight) according to Ajagbe *et al.* (2019) This finding corroborates with earlier reports by researchers who reported a range of 3.28 to 3.78% for rams fed mixtures of roughages and concentrates of the body weight An *et al.* (2020) reported a range of 3.25 to 3.67% for lambs fed diets containing *Foenicum vulgareas* additive. It was concluded on the average daily matter intake of the two genetic groups (Malpura and cross-bred lambs) were 754 and 755g/day amounting to 3.5% of their body weight. It was reported by Anaeto *et al.* (2009) that dry matter intake is an important factor in the utilization of feed by ruminants and is a critical determinant of energy utilization and performance in small ruminants. It was also indicated that feed intake is an important factor in the utilization of feed by livestock. The result obtained for total daily feed intake in this present study agreed with the report of Miller *et al.* (2003) who observed that feed intake by small ruminants depend on the palatability and fibre content of the diets.

Animal trends to consume diets more that find more pleasant or palatable irrespective of the nutrient value. Ibeawuchi *et al.* (2002) opined that beyond nutritional compositions of diets, animal tend to consume more of palatable diets. Quedrago *et al.* (1996) indicated that several factors influenced the acceptability of feed in terms of texture, coarseness or odour. Diets containing *Pennisetum purperum* at 2600kcal/kg might be more palatable or contained pleasant odour. The result from the growth response of the experimental animal diets mixed with basal diet *Pennisetum purperum*. The inclusion level of *Pennisetum purperum* in the diets of rams significantly influenced the weight gain, final weight gain and feed conversion ratio. The average weight gain was significantly higher in T₁ inclusion and lower in T₅ inclusion level, and this may be attributed to the level of the voluntary intake of the diet Forbes (1995) observed that if voluntary intake of feed by animal is too low, rate of production will be depressed. This factor has thus been described as one of the factor for production in small ruminant (Do Thi Than, 2006). Effect of mixture of basal diet *Pennisetum purperum* on the performance of the characteristic of West African Dwarf ram. The result revealed that the daily weight gain (49.13-77.86g/day) was significantly different was in line with the average daily weight gain (25.30- 54.40g/day) reported by Abdrrahaman *et al.* (2018) who fed *Piliostigma reticulatum* pods to Sokoto bucks. The daily weight gain was also in agreement with the findings of Jinadu *et al.* (2018) who reported an average daily weight gain of (29.35-41.43) for West African dwarf sheep fed diets containing varying level of sugar cane waste silage. The daily feed intake recorded in the study (580.98-642.56g/day) was within the reported by Abdrraham, *et al.* (2018). While below the daily feed intake reported by (Adebawale, 2004) of 544.16- 601.87g/day; also there was a shortfall as compared to the values reported by Aganga *et al.*, (1998) who reported 768.40-790g/day for goats fed with *Acacia fleckili* and *A. tortilis* respectively Ajayi *et al.* (2015) and Ososanya, (2010) indicated that feed intake is an important factor in the utilization of feed by livestock. The result obtained for the total daily feed intake agreed with the report of Yusuf and Adeloye, (2010) who observed that decreased intake of feed by ruminant depend on palatability and fibre content of the diets. Similarly, the result of feed conversion ratio revealed that West African Dwarf ram on 2600kcal/kg of *Pennisetum purperum* inclusion utilized the diets for body weight gain efficiently compared with other dietary treatment. The feed conversion ratio in this study (7.46- 12.86) were superior to the values reported by Jinadu *et al.* (2018) of 18.03- 29.33 who fed West African dwarf sheep with varying level of sugarcane waste silage but within the range of 10.60-13.71 reported by (Zelalem and Letcher, 1991) who evaluated the effect of some cereal-by products as energy source for fattening beef cattle.

IV. Conclusion

It can be concluded from this study that basal diet for West African Dwarf rams could be supplemented with 2600kcal/kg energy level of concentrate for better feed utilization and improved productivity.

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