ISSN:
Print - 2277 - 0755
Online - 2315 - 7453

Journal of Agricultural Science and Environment

EFFECTS OF FEED RESTRICTION AND REALIMENTATION ON PERFORMANCE AND NITROGEN UTILISATION IN GROWING WEST AFRICAN DWARF RAMS

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ABSTRACT

The effects of feed restriction on the performance of growing West African Dwarf sheep were determined in twenty four (24) growing West African dwarf (WAD) rams with average weight of 8.9 ± 0.59kg. The twenty-four WAD rams were allotted to three treatments of eight rams per treatment and balanced for weight in a Completely Randomized Design. Animals in group C which represents the control were fed with dried *Panicum maximum ad libitum* and concentrate supplement while group two (R1) and group three (R2) were fed with *P. maximum* without concentrate supplementation for one and two months, respectively. Thereafter, two months of realimentation followed the restriction. Data were taken on the feed intake, weight gain and digestibility. Results obtained on average daily gain showed significant difference ($P < 0.05$) whereby sheep on R2 group recorded the lowest value (50.7g/day) during restriction. Digestible organic matter intake (g/Kg $^{0.75}$ d^{-1}) for sheep on the C group was significantly ($P < 0.05$) higher than R1 group, but not significantly ($P > 0.05$) different from R2 group. The Crude protein intake was highest in the control (49.9g/day). Rumen amino acid of the control animals (4.1) was significantly ($P < 0.05$) higher than R1 (2.1) and R2 (3.5) groups. Nitrogen intake (g/day) was significant and higher in the C group (8.0) compared to the two restricted groups R1 and R2. During realimentation period, average daily weight gain (g/day) was highest ($P < 0.05$) for animals in the control (57.5) and least in R2 (34.5). The feed conversion ratio ranged from 8.3 (C) to 14.3 (R2) while the total weight gain (kg) ranged from 2.1 (R2) to 3.5 (C). Similarly, the CP intake (g/day) was higher in the control group compared to those in R1 and R2 groups. However, the dietary amino acid recorded in R2 differ significantly ($P < 0.05$) from R1 and C groups. During the realimentation period, nitrogen intake for rams in R1 (8.8g/day) and R2 (10.1g/day) groups doubled the values obtained during the restriction period. It was concluded that rams should be restricted for one month because they gained more weight than those restricted for two months.

Keywords: Feed restriction, Nitrogen utilization, Performance, Realimentation, WAD rams

INTRODUCTION

Adequate nutrition is the most important item in livestock management. Inadequate feeding, both in quantity and quality, accounts for low productivity of livestock in the tropics (Peters, 1988). Ruminants in Nigeria depend entirely on natural pastures for their feed (Abubakar *et al.,* 1998). Although natural pastures are adequate for maintenance and small weight gain during the wet season, the reverse is the case during the dry season. In view of the fact that pastures are not available throughout the year (Oladotun *et al*., 2003; Odeyinka and Okunade, 2005), it is therefore imminent that ruminant livestock could not meet their nutrient requirements for maintenance on natural grass alone (Adegbola, 1985). Thus, an animal could gain weight during the rainy season and lose weight during subsequent dry season (Pagot, 1992; Abubakar *et al*., 1998). Some animals could even die of starvation during prolonged dry season (Tarawali *et al*., 1993).

At certain times in the course of animal production, some small scale farmers do practice feed restriction. In ruminant production, it is a good management practice to underfeed, especially the ram during their growing period to minimize early fat deposit and perhaps to reduce production cost (Kamalzadeh *et al*., 1997. Lack of feed at any stage of growth is considered a poor management practice. However, evidence is accumulating that when feed restriction is carried out at an early age and adequate feeding ensues thereafter, the restricted lamb grow fast enough to compensate for the early weight depression in time for market age . Earlier work (Kamalzadeh *et al*., 1997) showed that feed restriction gave an improved efficiency of growth during compensation and feed efficiency was higher for realimented animals compared with unrestricted animals. The aim of this study was to determine the effect of feed quality restriction on the performance (feed intake, digestibility, nitrogen balance and weight gain) and, dietary and rumen amino acid utilization in growing West African dwarf (WAD) rams.

MATERIALS AND METHODS

Experimental Animals and Management

Twenty four (24) growing West African dwarf (WAD) rams between 6 and 8months old and with average weight of 8.9 $\pm$ 0.59kg were used for the experiment. The animals were sourced from villages around Abeokuta, Ogun State, Nigeria and used for the experiment that lasted for 120 days. Prior to the experiment, the animals were quarantined for 30 days during which they were given a prophylactic treatment of Oxytect L.A. (1ml/10kg body weight) and dewormed with albendazole® tablets (12.5g/kg body weight). They were treated against ectoparasites by bathing them with diazintol solution at 3ml/litre of water and given 0.5ml/kg BW of Ivermectin against mange. The animals were vaccinated against *Peste des Petit Ruminante* (PPR) which was considered as the most prevalent disease in the study. The animals were housed individually in open sided, well- ventilated disinfected pens (0.2m x 0.9m), with slatted floors to prevent them from having contact with their faeces and urine. They were allowed adaptation period of 30 days during which they were supplied with *Panicum maximum*, concentrate supplement and water *ad libitum.*

Experimental Groups and Diets

Animals were randomly allotted to three groups - Control (C); one month period of restriction (R1) and two months period of restriction (R2), with each containing eight lambs based on live weight in a completely randomized design. The control group(C) was fed with dried *Panicum maximum ad libitum* with concentrate supplement throughout the experimental period. R1and R2 groups were fed dried *P. maximum* solely for one month and two months, respectively thereafter animals in both R1 and R2 groups were fed *P. maximum* and concentrate supplements for 2 months of realimentation. The grass was chopped to about 2.5cm to reduce selection and avoid wastage by the animals. All animals were fed at 5% of their body weight per day. Feed was offered to the animals twice daily at 9.00hr and 14.00hr. The concentrate diet contained a combination of Maize bran (30.0%), Palm Kernel Cake (17.5%), Wheat Offal (40.0%), Groundnut Cake (10.0%), Bone Meal (1.5%) and Salt (1.0%) containing 173.5g/kg DM crude protein.

Data Collection

Animals were weighed at the beginning of the experiment and thereafter on weekly basis. The amount of feed offered was adjusted bi-weekly on the basis of their body weight. During each sampling period, representative feed samples were taken for chemical analysis. Residual feeds were collected and weighed daily. Before the start of feed restriction, two animals per treatment were randomly selected and transferred into individual metabolic cages which allowed separate collection of total faecal and urine output. This was repeated after the R1, R2 restriction and realimentation periods. Known quantity of feed was given to each animal and the left over was measured daily. Faeces and urine were collected during the last 7days of each restriction period. Fresh faecal samples were collected daily with 10% sample taken, oven dried at 60°C to a constant weight, kept and pooled for the 7 days collection period. About 20mls of urine was collected into a bottle containing 200ml of (100ml/L) tetraoxosulphate (vi) acid (H_2SO_4) to prevent evaporation of ammonia. The feed residues, faeces and urine were pooled over each collection period, weighed and representative samples were taken to the laboratory for chemical analyses.

Chemical Analysis

The dry matter (DM) contents of the feeds offered and faeces were determined by drying representative sub-samples to constant weight, while organic matter (OM) was estimated by subtracting the ash from the DM. Crude protein (ID 984.13), ash (ID 942.05) and Ether extract (ID 963.15) were analysed according to standard methods of AOAC (1995). Neutral detergent fibre (NDF), Acid detergent fibre (ADF) and Acid detergent lignin (ADL) were determined by the method of Van Soest *et al*. (1991).The Nitrogen (N) content of the faeces and urine were determined by the Kjeldahl method (A.O.A.C., 1995). The urine and faecal samples were analysed for their proximate composition using the procedure of A.O.A.C (1995).

Statistical Analysis

Data collected were analysed in a one way analysis of variance using the General Linear Model of SPSS (1999). The amount of amino acid nitrogen (AAN) available for absorption in the small intestine was estimated on the basis of microbial AAN synthesized in the rumen (AAN_m) and dietary N (AAN_d) escaping rumen degradation, as follows;

$$AAN_m = (A * B * C * D * DOMI) / E \text{....... equation 1}$$

where:
A = 0.7; partial digestion in the rumen or rumen degraded organic matter (Van Bruchem *et al*., 1985)
B = 0.2; efficiency of microbial protein synthesis (Oosting, 1993: to avoid over estimation, this value was set at 0.15 for the R group during the period of restriction);
C = 0.75; true protein in microbial protein (Van Bruchem *et al*., 1985);
D = 0.85; true small intestinal digestibility of microbial protein (Van Bruchem *et al*., 1985);

E = 6.25; protein to N conversion factor;
DOMI = digestible organic matter intake ($g\ kg^{-0.75}\ d^{-1}$).

$AAN_d = F * G * N$ ………equation 2

where:
F = 0.5; proportion of N escaping rumen degradation;
G = 0.8; true digestibility in the small intestine;
N = nitrogen in feed ($g\ kg^{-0.75}\ d^{-1}$)

RESULTS

Chemical composition of the grass and concentrate fed to the experimental rams (Table 1) showed that the crude protein (173.5g/kg DM) in the concentrate doubled that of *P. maximum* (80.6g/kg DM). Dry matter, organic matter, crude protein, acid detergent fibre and acid detergent lignin were higher in the concentrate feed than *P. maximum*. Neutral Detergent fibre of *P. maximum* was higher than in concentrate diet.

Table 1: Chemical composition (g/kg DM) of concentrate and grass fed to growing WAD sheep during feed restriction and realimentation

Parameters	Forage	Concentrate
Dry matter	833.1	907.6
Organic matter	721.9	834.3
Crude protein	80.6	173.5
Ash	111.2	73.3
Neutral detergent fibre	652.5	384.0
Acid detergent fibre	368.8	767.0

Average initial weights were similar (P > 0.05) between the groups. Weight gained by WAD rams in the control and R2 were significantly (P < 0.05) higher than in R1 (Table 2). Average daily weight gained (g/day) of rams in the control group was significantly higher (P < 0.05) than R1 and R2 groups. Highest DM intake (g/day) was recorded for animals in the control group which was not significantly (P > 0.05) different from the value obtained for animals in the R2 group. There was significant (P < 0.05) difference in DM intake between the control group and R1 (346.8 ± 17.67 and 265.8 ± 8.34, respectively), but not (P > 0.05) between the control and the R2. Feed conversion ratio was higher (P < 0.05) in the R2 group but was similar in both control and R1 groups.

During realimentation period, the initial weight of the control was significantly (P < 0.05) different from the restricted groups. The same trend was observed with the final weight. Weight gained was higher in the control group than R1 and R2 groups. Animals in R1 recorded the highest (P < 0.05) DM intake while those in R2 group had the least. Average daily gain (g/day) was significant (P < 0.05) and followed the order control (57.5) > R1 (43.3) >R2 (34.5). Feed conversion ratio was similar (P > 0.05) among the treatments.

Table 2: Performance characteristics of West African Dwarf Sheep during feed restriction and realimentation

Parameters	C	R1	R2
	Restriction		
Initial weight (kg)	8.6 ± 0.27	7.9 ± 0.26	8.2 ± 0.43
Final weight (kg)	13.1 ± 0.27	9.5 ± 0.25	11.2 ± 0.42
Weight gain (kg)	4.4 ± 0.07[a]	1.6 ± 0.07[b]	3.0 ± 0.09[a]
Average Daily Gain(g/day)	73.7± 9.93[a]	54.0 ± 8.85[b]	50.7 ± 12.34[b]
Total DMI (g/day)	346.8±17.67[a]	265.8±8.34[b]	294.2±22.91[ab]
Feed conversion ratio	4.7± 0.27[b]	4.9± 0.28[b]	5.9± 0.18[a]
	Realimentation		
Initial weight (kg)	13.1 ± 0.28[a]	9.5 ± 0.29[b]	11.2 ± 0.33[b]
Final weight (kg)	16.5 ± 0.29[a]	12.1 ± 0.29[b]	13.3 ± 0.31[b]
Weight gain (kg)	3.5 ±0.09[a]	2.6 ± 0.08[b]	2.1 ± 0.08[c]
Average Daily Gain (g/day)	57.5 ± 7.56[a]	43.3 ± 14.20[b]	34.5 ± 9.45[c]
Total DMI (g/day)	494.4 ± 11.62	507.5±19.87	470. 2 ± 14.51
Feed conversion ratio	8.3± 0.50	11.1± 0.33	14.3±0.50

a,b,c: Means in the same row having different superscripts are significant ($P < 0.05$)
C- Control R1 - One month feed restriction R2- Two months feed restriction
DMI - Dry Matter Intake

Rams in the control group had a higher cumulative weight gain (Figure 1) followed by rams in R1 and R2, respectively. The graph further showed that the R1 animals exhibited a constant cumulative weight gain between weeks four and six. Also the R2 and C animals had a constant cumulative weight gain between weeks five and six. Cumulative digestible organic matter intake (g) by the experimental animals increased steadily with time (Figure 2). There was no significant difference ($P > 0.05$) in the cumulative digestible organic matter intake between R1 and R2 animals.

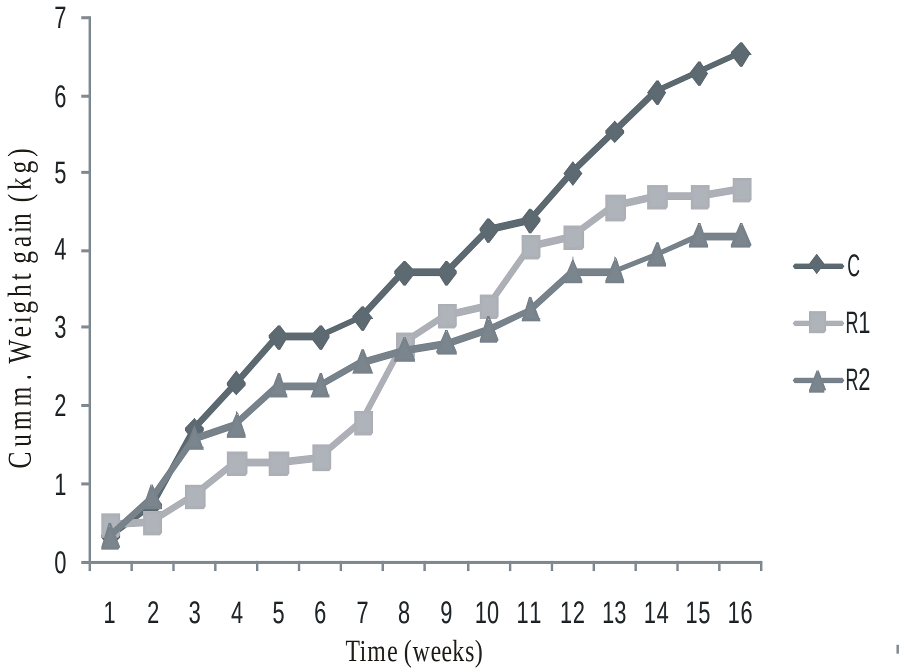

Figure 1: Graph of weight gained (kg) in WAD rams during feed restriction and realimentation

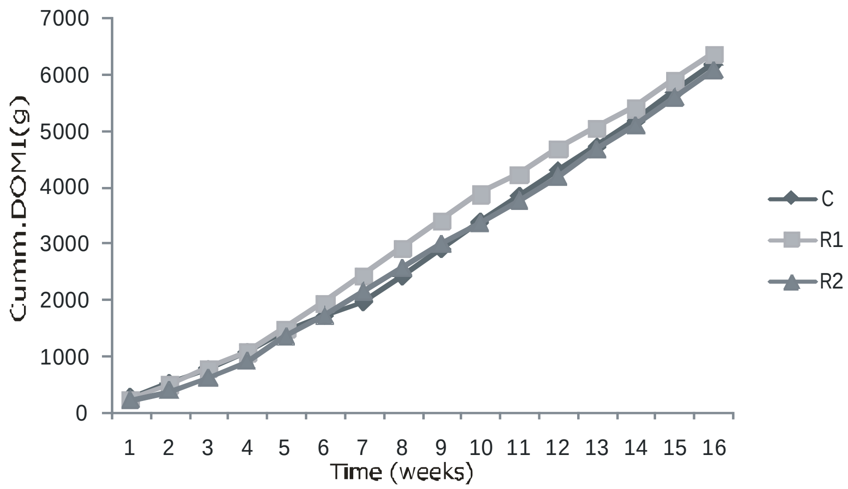

Figure 2: Graph of Cumulative Digestible Organic Matter Intake (g) in WAD rams during feed restriction and realimentation

During restriction protein intake (g/day) was similar (P>0.05) in all the treatments. Rumen amino acid nitrogen (AAN_m) in the control animals (4.1) was significantly (P < 0.05) higher than in R1 (2.1) and R2 (3.5). Dietary amino acid nitrogen (AAN_d) in the control animals (3.2) was also significantly (P < 0.05) higher than both R1 and R2. After realimentation period, digestible organic matter intake ($gkg^{-0.75}d^{-1}$) increased and was similar in all the groups. The CP intake during this period was higher (P > 0.05) in R2 than R1 and control groups. The AAN_m increased during this period for R1 (6.45) followed by C and R2 (6.33 and 6.06, respectively). AAN_d in the R2 group (4.0) was significant (P < 0.05) higher than R1 (3.5) and C group (3.2).

Nitrogen intake (g/day) was significantly (P < 0.05) higher in the control group than the two restricted groups (Table 4). Faecal Nitrogen (g/day) in R1 group was higher (P < 0.05) than C and R2 groups. Urinary nitrogen in the R2 group was different (P < 0.05) from C and R1 groups. Nitrogen retention, when expressed in g/d or % of intake or $g/kgW^{0.75}$ was higher (P < 0.05) in the C group than R1 and R2 groups. After realimentation, R2 animals were higher (P < 0.05) in their nitrogen intake (g/day) than those in other groups. Similar trend was observed in faecal nitrogen excretion (g/day). Both R1and R2 animals excreted higher (P< 0.05) nitrogen via urine than the C group. Retained nitrogen (g/day) was similar in both R1 and R2 groups but was significantly (P< 0.05) lower in the R2 group when expressed in percentage of intake.

Table 3: Protein utilization by WAD Sheep during feed restriction and realimentation

Parameters	C	R1	R2
	Restriction		
DOMI (gkg-0.75d-1)	284.9±108.26[a]	193.7±31.69[b]	237.2±95.91[ab]
Crude Protein Intake (g/day)	49.9 ±0.14	25.8 ± 0.13	29.7 ± 0.09
Nitrogen Intake (g/day)	8.0±0.89[a]	4.1±0.78[b]	4.8±0.58[b]
AANm	4.1 ± 0.25[a]	2.1 ± 0.99[b]	3.5 ±0.33[b]
AANd	3.2 ± 0.52[a]	1.7 ± 0.09[b]	1.1 ± 0.27[b]
	Realimentation		
DOMI (gkg-0.75d-1)	443.6 ±10.64	451.8 ± 17.50	424.4 ± 13.32
Crude Protein Intake (g/day)	49.9 ± 0.14	55.3±0.07	62.8 ±0.15
Nitrogen Intake (g/day)	8.0±0.89	8.8±0.42	10.1±0.91
AANm	6.3 ± 0.15	6.5 ± 0.25	6.1 ± 0.19
AANd	3.2 ± 0.30[c]	3.5 ± 0.06[b]	4.0 ± 0.04[a]

a,b,c: Means in the same row having different superscripts are significant (P< 0.05)
C- Control R- One month feed restriction R2- Two months feed restriction
AAN_m - Amino acid Nitrogen (rumen) AAN_d - Amino Acid Nitrogen (dietary)
DOMI - Digestible Organic Matter Intake

Table 4: Nitrogen retention in WAD sheep during feed restriction and realimentation

Parameters	C	R1	R2
	Restriction		
Nitrogen Intake (g/day)	7.89 ± 0.50[a]	4.12 ± 0.06[b]	4.75 ± 0.50[b]
Faecal Nitrogen (g/day)	1.46 ± 0.27[b]	1.70 ± 0.11[a]	1.42 ± 0.15 [b]
Urinary Nitrogen (g/day)	0.06 ± 0.004[b]	0.06 ± 0.001[c]	0.08 ± 0.010[a]
Retained Nitrogen (g/d)	6.46 ± 0.67[a]	2.36 ± 0.02[b]	2.56 ± 0.43[b]
Retained Nitrogen (% intake)	81.0 ± 0.63[a]	57.3 ± 4.42[b]	53.9 ± 1.68[c]
Retained Nitrogen(g/kgW 0.75)	4.02 ± 0.32[a]	1.91 ± 0.02[b]	2.41 ± 0.24[b]
	Realimentation		
Nitrogen Intake (g/day)	7.98 ± 0.50[c]	8.84 ± 0.45[b]	10.1 ± 1.25[a]
Faecal Nitrogen (g/day)	1.46 ± 0.27[b]	1.48 ± 0.27[b]	2.92 ± 0.89[a]
Urinary Nitrogen (g/day)	0.06 ± 0.004[b]	0.09 ± 0.007[a]	0.09 ± 0.018[a]
Retained Nitrogen (g/day)	6.46 ± 0.67[b]	7.28 ± 043[a]	7.04 ± 0.38[a]
Retained Nitrogen (% intake)	81.0 ± 4.42[a]	82.4 ± 1.44[a]	70.1 ± 4.78[b]
Retained Nitrogen(g/kgW 0.75)	4.02 ± 0.32	4.43 ± 0.20	4.33 ± 0.18

a,b,c means in the same row having different superscripts are significantly different (P< 0.05)
C - Control R1- One month feed restriction R2- Two month feed restriction

Table 5 shows the nutrient digestibility (%) in WAD rams during restriction and realimentation periods. Organic matter digestibility by animals in the control group was significantly ($P < 0.05$) higher than the restricted groups. Dry matter digestibility in the C and R2 groups were significantly ($P < 0.05$) higher than R1. Crude protein digestibility followed a similar trend as observed in DM digestibility. Ether extract digestibility was significantly ($P < 0.05$) higher in the C group than both R1 and R2 groups

Table 5: Nutrient digestibility (%) in WAD sheep during feed restriction and realimentation

Parameters	C	R1	R2
	Restriction		
Organic matter	87.4 ± 1.07[a]	75.5 ± 0.59[c]	81.7 ± 1.64[b]
Dry matter	84.8 ± 1.22[a]	74.1 ± 0.85[b]	80.9 ± 1.47[a]
Crude protein	88.5 ± 1.74[a]	58.6 ± 1.66[b]	85.0 ± 6.85[a]
Ether extract	93.4 ± 0.52[a]	88.4 ± 0.30[b]	88.2 ± 1.01[b]
Crude fibre	84.8 ± 1.80	78.1 ± 1.32	83.5 ± 2.01
Ash	91.0 ± 0.78[a]	84.7 ± 0.99[b]	87.3 ± 2.17[ab]
NDF	85.4 ± 1.22[a]	72.3 ± 0.85[c]	78.2 ± 1.51[b]
ADF	81.6 ± 1.32[a]	67.7 ± 0.48[c]	74.8 ± 2.44[b]
ADL	88.2 ±1.79[a]	75.8 ±1.76[b]	82.0 ±1.73[ab]
	Realimentation		
Organic matter	87.4 ± 1.07[b]	90.1 ± 2.30[a]	85.0 ± 5.02[c]
Dry matter	84.8 ± 1.22	84.3 ± 1.23	84.7 ± 4.73
Crude protein	88.5 ± 1.74[a]	83.2 ± 1.33[b]	82.5 ± 6.21[b]
Ether extract	93.4 ± 0.52[a]	89.7 ± 1.37[b]	89.5 ± 4.03[b]
Crude fibre	84.8 ± 1.80[a]	78.2 ± 3.83[b]	77.2 ± 11.20[b]
Ash	91.0 ± 0.78[a]	87.5 ± 2.70[b]	87.1 ± 7.67[b]
NDF	85.4 ± 1.22[a]	82.5 ± 1.11[b]	83.3 ± 5.25[b]
ADF	81.6 ± 1.32[a]	75.7 ± 1.59[b]	76.4 ± 8.01[b]
ADL	88.2 ± 1.79[a]	79.5 ± 3.14[b]	78.5 ± 7.44[b]

a, b, c mean values in the same row having different superscripts are significantly different ($P < 0.05$)

C- Control R1- One month feed restriction R2- Two months feed restriction
NDF - Neutral Detergent Fibre ADF - Acid Detergent Fibre ADL- Acid Detergent Lignin

DISCUSSION

The observed crude protein (CP) content in the concentrate diet was within the range recommended (Gatenby, 2003) for meeting the protein requirement of sheep and to generate a high level of ammonia in the rumen from degradable protein for an efficient digestion process (Orskov, 1995) and a subsequent microbial protein supply to the host animal. The CP in *P. maximum* was higher than values reported by other researchers (Arigbede *et al*., 2002, Isaac *et al*., 2008). However, the result obtained is in line with Abegunde *et al*. (2008). Variations in feed quality may be due to season, harvesting, fertilizer treatment and analytical procedures. High CP in the concentrate is essential for animals in R1 and R2 during realimentation and has been considered an important factor that enables high intake of feed. The acid detergent fibre in *P. maximum* was lower than value earlier reported (Bamikole *et al.,* 2003; Ajayi *et al.,* 2005 and Babayemi *et al*., 2006). The high neutral detergent fibre in *P. maximum* suggests that animals will consume less forage than expected, a factor that ensured intake of the grass was restricted. The chemical composition of the concentrate was similar to that previously reported (Fajemisin *et al.,* 2008).

Rams subjected to one month feed restriction had a higher total DMI than those subjected to two months feed restriction. This is consistent with the results obtained in Belgian blue bulls offered maintenance ration for 123 days (restriction period) and realimented for 204 days (Hornick *et al*., 1999). Increase in feed intake during realimentation of restricted animals could be a consequence of increases in size of the digestive tract, energy requirement for maintenance, protein deposition and modification of the endocrine system. The lower performance of rams in R2 group compared to other groups in terms of weight gained, average daily weight gain and feed conversion ratio may be due to their lower DMI relative to other groups. The total DMI (g/day) was higher in C group than the R1 and R2 which is in line with report of studies by Dixon and Stockdale (1999). The restricted animals maintained weight on low quality feed. Hence the result of this study suggests that under low plane of nutrition, physiological and metabolic changes in the body would create a condition that animals can benefit from ingesting low quality feed. The greater gain of realimented animals suggests that these animals had a rapid increase in energy storage (Kamalzadeh *et al*., 1997). However, inability of rams in the restricted groups to achieve similar live weight gain with the control group indicate that there was incomplete recovery as reported in other studies (Abdala *et al*., 1988; Cartens *et al*., 1991; Hornick *et al*., 1999). Live weight gain in the R1 rams during realimentation period was higher than rams on R2 although rams on R2 seemed to have adjusted to feed restriction after one month such that realimentation with concentrate did not have a superior effect as observed in R1 rams Lack of complete compensation of live weight gain within the 2 months of realimentation could be related to the severity of nutritional stress during the restriction period (Drovilard *et al.,* 1991) which is more important than duration of feed restriction for compensatory growth. Cumulative weight gained in the control group during the restriction period was slightly higher than the values recorded for the restricted animals. Although the restricted animals had a lower weight gained at the start of restriction, after the second week there was an increase in intake pattern over a period of two weeks. The poor intake pattern of feed by the restricted animals may be due to the nutritional stress they were subjected to over a period of time. Also the increase in the cumulative digestible organic matter intake had no marked difference on the animals in the restricted groups, while animals in the control group increased in weight as cumulative digestible organic matter intake increased during the restriction periods. In the realimentation phase, the restricted groups had a higher increase in weight than the control animals. Concentrates fed to the animals during realimentation has been found to increase the feeding value by supplying additional energy over and above that supplied by the grass (Leng, 1990; Ngwa and Tawah, 2002). Also, when the quantity and quality of pasture deteriorate, concentrate feeding increase intake and ensure the maintenance of performance at a given level. Mpairwe *et al*. (2003) observed that providing supplements with adequate crude protein to ruminants promoted dry matter intake, rumen degradation and nutrient flow to the small intestine and culminated in higher animal performance. The observed average daily weight gained during realimentation were within the range of 28.8 to 55.2g/day previously reported for sheep (Alli-Balogun *et al*. 2003 and Taiwo *et al.* 2005). Increased weight gain during realimentation period observed in R1 could be a consequence of increased feed efficiency of protein and energy utilization, increased feed intake, increased gut fill and decreased heat production during the restriction period and its continuation during the realimentation period (Yamberyamber *et al.,* 1996). Increase in the size of gastrointestinal tract and the amount of gut contents may account for all or portion of the weight gain during compensatory growth (Weekes, 2000).

Nitrogen retention, faecal nitrogen output for animals on 2 month restriction was higher than the control group during realimentation and there was increase in values from the restricted phase to the realimentation period. This result is not consistent with the findings of Fujihara *et al*. 1984 who reported a lower faecal nitrogen output when lambs were fed Ladino Clover and treated silage on a continuous basis. The urinary nitrogen excretion was more in the realimentation phase than in the restricted phase and as a result the retained nitrogen was considerably high in the realimentation phase of the restricted animals. In this study, higher retained nitrogen (g/day, % and g/kg$W^{0.75}$) values observed during the realimentation corroborates previous reports (Mupangwa *et al*., 2000) that nitrogen retention increased with additional protein in the diet

CONCLUSION

Feeding grass alone for one month depressed rate at which weight was gained in rams beyond which rams adjusted. Realimentation for two months had greater influence on rams restricted for one month with better nitrogen utilization in the restricted animals compared to control animals during realimentation. Rams should be restricted for one month because they gained more weight than those restricted for two months.

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(Manuscript received: 8th March, 2012; accepted: 10th October, 2012).