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# FEED INTAKE, GROWTH PERFORMANCE AND NUTRIENT DIGESTIBILITY IN RED SOKOTO BUCKS FED GUINEA GRASS (*Panicum maximum*) HAY SUPPLEMENTED WITH CONCENTRATES.

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## ABSTRACT

For profitability in livestock production, there is a need for reduction in production cost, which is achievable by increasing the forage inclusion in the diet of ruminant animals. A feeding trial was conducted for one hundred and fifteen (115) days to determine the total feed intake, live weight gain, and digestibility coefficient in Red Sokoto bucks fed a basal diet of *Panicum maximum* hay supplemented with concentrate in the ratio 75:25, 50:50, and 25:75 for treatments 2, 3 and 4, respectively, while bucks in treatment 1 were fed 50:50 ratio of *Digitaria smutsi* hay and concentrate, all at 3% body weight. The animals were allotted to four dietary treatments with three animals per treatment in a complete randomized design. Feed intake, live weight gain, and digestibility coefficients were determined. The results showed that the growth rate and coefficient of digestibility were significantly higher ($P<0.05$) in bucks fed 50:50 *Panicum maximum* and concentrate than all other treatments. It was concluded that bucks fed *Panicum maximum* hay and concentrate had higher feed intake, digestibility, and better weight gain. *Panicum maximum* and Concentrate should be fed to growing red Sokoto goats (bucks) for better growth and digestibility.

**Key words:** Growth; digestibility; concentrate; *Panicum maximum*; Red Sokoto bucks.

## INTRODUCTION

The primary obstacle confronting ruminant husbandry is the skyrocketing cost of production stemming from rising local feed ingredient prices. One of the main causes of these native breeds' sub performance has been shown to be their nutrition (Joseph et al., 2018 2010; Odoemelam *et al.*, 2013). This challenge has led to low livestock productivity and a reduction in the amount of animal protein available for human consumption in developing nations (FAO, 2009). This is caused by an over-reliance on feedstuffs with low digestibility, which fall short of the animals' seasonal maintenance needs (Lamidi and Olugbose, 2014), causing a significant decline in the output of some livestock species, including pigs, chicken, goats, and cattle, and as a result a significant financial loss for the producers (Tona *et al.*, 2014).

According to recent estimates, there are 76 million goats, 43.4 million sheep, and 18.4 million cattle in Nigeria's national herd (FMARD, 2017). To be more precise, grazing and browsing are the primary methods of goat husbandry in Nigeria, which is traditional but insufficient for achieving optimal production and reproductive success (Anifowose, 2016). Approximately 80% of Nigeria's population lives in rural areas, where goats play a significant role in their way of life. (Ukanwoko *et al.*, 2009; Ahamefule, 2005). In addition to having a major positive impact on family health and nutrition, the sale of animals and their products helps maintain household finances.

The single but most crucial feed source for ruminants in the world are forages, which are edible parts of plants apart from separated grains, usually with substantial cell walls. They are suitable for use by herbivores that have the capacity to microbially digest cell wall constituents (Wilkins, 2000). *Panicum maximum* is a palatable species with high dry matter yield and ease of establishment and is widely cultivated as pastures for producing good quality hay (Gibbs *et al.*, 1990; Ewetola, 2018; Muraina *et al.*, 2016; Akinola, 2018). Because forages increase microbial activity and the pH of the rumen, they are a natural and primary source of diet for ruminants. According to Lamidi and Ogunkunle (2015), animals who are solely fed diets consisting of dry grains experience a variety of digestive issues. An alternative to feeding ruminants has been suggested to be sown pasture combined with supplemental food, particularly in the dry season. In order to avoid low rumen acidity, which can lead to stomach problems, it is necessary to give ruminants enough fodder. However, natural pastures in the tropics are the foundation of ruminant production, and these pastures lack sufficient nutrients to suit the dietary needs of the animals (Matesz, 2001).

Therefore, this study investigated the growth performance and nutrient digestibility of growing red Sokoto bucks fed *Panicum maximum* hay grown in sown pasture and supplemented with concentrate in the northern guinea savanna of Nigeria.

## MATERIALS AND METHODS

### Experimental site

The study was carried out at the Teaching and Research Farm of the Department of Animal Science, Ahmadu Bello University, Zaria, Nigeria. The site is located in the Northern Guinea Savanna of Nigeria within the longitude $7^0$39'14.79"E 671 m and latitude $11^0$09'01.78"N above the sea level.

### Experimental animals and their management

Twelve intact growing Red Sokoto bucks with an average weight of 10.0 ± 0.5 kg were purchased from the Kafur market in the Kafur local government area of Katsina State. The animals were initially balanced for weight and randomly allotted to four dietary treatments in a Complete Randomized Design (CRD). Furthermore, the experimental animals were administered Ivomec injections (subcutaneously) against endoparasites and ectoparasites and vaccinated against Peste des Petits Ruminants (PPR) disease during quarantine.

### Data collection

The animals were offered weighed quantities of the concentrate and *P. maximum* hay. The daily total feed intake was estimated as the difference between the feed given and the orts. Data on body weight gain were collected at 2-weeks intervals, and the experiment lasted for 90 days. Total weight gain (TBWG = FBW-IBW), daily weight gain (DWG = TWG/90), and feed conversion ratio (FCR = DDMI/DWG) were estimated, where TBWG = total body weight gain, FBW = final body weight, IBW = initial body weight, DWG = daily weight gain, TWG = total weight gain, FCR = feed conversion ratio, DDMI = digestible dry matter intake.

**Digestibility Experiment:** Sixteen bucks were used in the experiment, four (4) bucks per treatment. They were housed in individual metabolic cages ideal for easy faeces and urine collection, as described by Osuji *et al*. (1993. Four bucks from each treatment group were assigned to each experimental diet, fed once daily in the morning, and water was provided *ad libitum*. The trial lasted for 21 days. The first 14 days were for acclimatization, and fecal collection followed in the subsequent 7 days (*Osuji et al*., 1993).Total faecal output from individual animals was collected daily in the morning, weighed, and thoroughly mixed, and a 10% sub-sample was taken for dry matter determination. The total faecal samples collected over seven (7) days were bulked and subsampled for laboratory analysis.

### Chemical Analysis

Feeds and faeces were analyzed for dry matter (DM), Crude Fiber (CF), Crude Protein (CP), Ether Extract (EE) and Ash using the AOAC (2005) procedure. Nitrogen Free Extract (NFE) was calculated as difference, NFE=100 - (CF + CP + EE + Ash). Acid Detergent Fiber (ADF) and Neutral Detergent Fiber (NDF) were determined according to the method described by Van-soest *et al.* (1991). Samples of experimental diets and faeces were ashed by charring in a muffled furnace at $550^0$C for six (6) hours. Organic matter (OM) was obtained as the difference between the dry matter and residual ash content.

### Statistical analysis

Data collected were analysed by analysis of variance ANOVA using the General Linear Model Procedure of SAS (2002). Significant ($P<0.05$) differences among treatment means were separated using the Duncan Multiple Range Test (DMRT) of the same statistical package.

## RESULTS

### Chemical composition and metabolizable energy of the experimental diets

The dry matter content of *Panicum maximum* hay fed was 92.65% as against 92.91% in *Digitaria smutsii* hay, which is a little above that of the *Panicum maximum* while the CP content was higher in *P. maximum* than *in D. smutsii* with 11.65% and 6.31% respectively. The CF, Ash, ADF, NDF, and metabolizable energy of *Panicum maximum* were also higher when compared with those of the *Digitaria smutsii* hay. In contrast, *D. smutsii* hay has higher EE and NFE than *Panicum maximum* hay (Table I).

**Table I. Chemical composition and metabolizable energy of the experimental diets fed to growing Red Sokoto bucks**

| Parameters (%) | Concentrate | *Panicum maximum* | *Digitaria smutsii* |
|---|---|---|---|
| Dry matter | 92.66 | 92.65 | 92.91 |
| Crude protein | 14.72 | 11.65 | 6.31 |
| Crude fibre | 11.92 | 38.70 | 29.61 |
| Ether extract | 2.03 | 0.35 | 5.99 |
| Ash | 11.96 | 6.33 | 5.51 |
| NFE | 59.37 | 43.01 | 47.09 |
| ADF | 2.64 | 42.46 | 30.16 |
| NDF | 14.66 | 73.65 | 59.55 |
| ME(MJ/KgDM) | 11.63 | 11.72 | 11.03 |

NFE= Nitrogen Free Extract, ADF=Acid Detergent Fibre, NDF=Neutral Detergent Fibre.ME (MJ/kg DM) = 11.78+0.0064CP+ (0.00065 EE) 2 -0.0118A (Alderman1985).

**Effect of forage intake and concentrate supplementation on the performance of Red Sokoto bucks**

There was no difference (P>0.05) in the dry matter intake of the bucks across the treatments (Table II). The average concentrate intake (ACI) was (P<0.05) higher in treatment 2 by 57% than the control. However, the average forage intake (AFI) was higher (P<0.05) in the group fed a 25:75 concentrate/forage ratio than in the other treatments. Meanwhile, average feed intake (AFI) was not (P>0.05) significantly different among the treatments. Final body weight in treatments 2 and 3 was similar but significantly (P<0.05) higher (13%) than in the control and treatment 4. The results obtained for total weight gain (TWG) and average daily weight gain (ADWG) followed the same trend as the final body weight gain (FBWG). The best feed conversion ratio (FCR) was obtained in bucks fed 50:50 *Panicum maximum*/concentrate compared with other treatments.

**Table II. Performance of growing Red Sokoto Bucks fed *Panicum maximum* hay and mixtures of concentrate.**

| Parameters | T1 (Control) | T2 (75:25) | T3 (50:50) | T4 (25:75) | SEM | P-Value |
|---|---|---|---|---|---|---|
| Dry matter intake | 28.48 | 28.98 | 30.43 | 28.71 | 0.27 | 0.86 |
| ACI(g/day) | $179.72^{b}$ | $281.55^{a}$ | $194.21^{b}$ | $91.94^{c}$ | 2.31 | 0.0002 |
| Hay intake (g/day) | $180.32^{b}$ | $103.69^{c}$ | $196.63^{b}$ | $276.90^{a}$ | 1.54 | 0.0001 |
| AFI (g/day) | 360.04 | 385.24 | 390.91 | 368.85 | 3.48 | 0.79 |
| IBW (kg) | 10.67 | 10.67 | 10.73 | 10.93 | 0.11 | 0.99 |
| FBW (kg) | $11.83^{b}$ | $13.33^{a}$ | $13.60^{a}$ | $12.10^{b}$ | 0.11 | 0.36 |
| TWG (kg) | $1.17^{b}$ | $2.67^{a}$ | $2.87^{a}$ | $1.17^{b}$ | 0.03 | 0.001 |
| ADWG (kg) | $13.89^{b}$ | $31.75^{a}$ | $34.13^{a}$ | $13.89^{b}$ | 0.40 | 0.001 |
| FCR (kg DMI/kg gain) | $27.16^{c}$ | $12.50^{b}$ | $11.52^{a}$ | $29.26^{c}$ | 1.00 | 0.03 |

$^{abc}$Means with different superscripts within rows differed significantly (P<0.05), ACI= Average Concentrate Intake, AFI= Average Feed Intake, IBW= Initial Body Weight, FBW= Final Body Weight, TWG= Total Weight Gain, ADWG= Average Daily Weight Gain, FCR= Feed Conversion Ratio, SEM= Standard Error of the Mean

**Apparent nutrient digestibility of Red Sokoto bucks fed diets containing mixtures of *Panicum maximum* and concentrate.**

The diets had no effect (P>0.05) on dry matter and organic matter digestibility (Table III). Crude protein digestibility was significantly (P<0.05) affected by the diets. All the imposed treatments had higher CP digestibility than the control. Treatments 3 and 4 had similar and higher crude fibre digestibility than the other treatments. The highest and lowest values were recorded in the control (85.72%) and treatment 4 (27.38%) groups for apparent ether extract digestibility. Diets 2 and 3 had significantly (P<0.05) higher nitrogen-free extract digestibility than diets 1 and 4; the lowest digestibility was observed in treatment 4. The digestibility of acid detergent fibre and neutral

detergent fibre was significantly (P<0.05) higher in treatments 3 and 4, while the control had the lowest digestibility (63.20%).

**Table III. Apparent nutrient digestibility of growing Red Sokoto Bucks fed *Panicum maximum* hay and concentrate in ratios.**

| Parameters | Control | 75:25 | 50:50 | 25:75 | SEM | P-Value |
|---|---|---|---|---|---|---|
| Dry Matter | 71.36 | 73.64 | 75.01 | 72.04 | $0.21^{NS}$ | 0.35 |
| Organic Matter | 70.92 | 72.34 | 72.56 | 74.37 | $0.21^{NS}$ | 0.46 |
| Crude Protein | $71.05^{b}$ | $81.04^{a}$ | $79.52^{a}$ | $78.17^{a}$ | 0.18* | 0.01 |
| Crude fibre | $91.49^{b}$ | $90.95^{b}$ | $94.28^{a}$ | $94.27^{a}$ | 0.07* | 0.001 |
| Ether Extract | $85.72^{a}$ | $67.16^{b}$ | $58.00^{c}$ | $27.38^{d}$ | 0.33* | 0.0001 |
| Ash | $83.13^{b}$ | $86.93^{a}$ | $86.93^{a}$ | $79.95^{c}$ | 0.11* | 0.009 |
| Nitrogen free extract | $58.48^{ab}$ | $63.09^{a}$ | $62.05^{a}$ | $54.19^{b}$ | 0.33* | 0.08 |
| Acid Detergent Fibre | $63.20^{b}$ | $54.48^{c}$ | $76.58^{a}$ | $81.79^{a}$ | 0.29* | 0.0001 |
| Neutral Detergent fibre | $59.54^{b}$ | $49.06^{c}$ | $72.90^{a}$ | $81.14^{a}$ | 0.42* | 0.0003 |

$^{abcd}$Means with different superscripts along the same row are significantly different (P<0.05) SEM= standard error of the mean

## DISCUSSION

**Growth Performance** The animals offered dietary treatment 3 produced the highest body weight gain compared with the other treatments. This could be related to the efficient utilization of absorbed nutrients in sufficient quantities in the 50:50 feed mixture. This result aligns with the findings of Anifowose *et al.* (2016) and Babayemi *et al.* (2021) who reported higher weight increase in bucks fed *Panicum maximum* and cowpea shell-based concentrate and *Panicum maximum* with *Lablab purpureus*-based concentrate, respectively, at 50:50 ratios compared with other treatments.

In this study, the highest feed conversion ratio was recorded in the group fed 50:50 ratio. This could be due to the associative effect of feeding resulting from a high intake of concentrate and forage, which may have stimulated appetite, increased rumen microbial replication, and enhanced the production of volatile fatty acids used as an energy source in ruminants. Moreover, it is probable that the feed is rich in energy (11.63MJ) and protein (11.65%) contents, as observed in the nutrient composition of the experimental diet (Table 1), contributing to efficient feed conversion in the bucks fed. This agrees with the report of Tona *et al.* (2014) and Anifowose *et al.* (2016) who fed *Panicum maximum* and *Moringa oleifera* based concentrates and *P. maximum* with cowpea based concentrate, respectively, and adjudged bucks fed 50:50 ratio to have the best feed conversion ratio when compared with other treatments.

**Apparent Nutrient Digestibility**

The CP, CF, EE, NFE, NDF and ADF followed the same trend, with the bucks fed (50:50) C:P having the best coefficient of digestibility in all parameters. Arigbede *et al.* (2005) reported a similar observation that the digestibility coefficients of CP, NDF, ADF, ADL, and DM were highest in bucks fed diets containing graded levels of *Panicum maximum* and *Grewia pubescens* at 50:50 ratio. Tona *et al.* (2014) reported a similar observation when WAD bucks were fed *Panicum maximum* as a basal diet and supplemented with *Moringa oleifera* based concentrate. Based on this finding, it was concluded that feeding Red Sokoto bucks with 50:50 concentrate and *Panicum maximum*(C:P) mixture is the best in terms of digestibility coefficient compared with 25:75 and 75:25 (C:P). This is because both the *Panicum maximum* and concentrate contained substantial amounts of CP. Thus, as the crude protein in the diet increases, CP digestibility also increases. This agrees with the report of Babayemi *et al.* (2021), who reported high nutrient digestibility in Red Sokoto bucks fed *Panicum maximum* with *Lablab purpureus* based concentrate in the ratio 50:50, but in contrast to the findings of Adebisi *et al.* (2016), who reported the best nutrient digestibility in bucks fed 75% *Panicum maximum* and 25% *Gmelina arborea* leaf-based concentrates.

**CONCLUSION AND RECOMMENDATIONS**

It was concluded that *Panicum maximum* hay and concentrate fed at 50:50 ratio exhibited the best growth performance and efficient nutrient digestibility in growing Red Sokoto bucks in Samaru, northern Guinea Savanna of Nigeria. Therefore, it is recommended that a 50:50 ratio of *Panicum maximum* and concentrate be fed to growing Red Sokoto bucks for efficient nutrient digestibility and rapid growth rate.

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