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EFFECTS OF INCLUSION LEVEL AND FEEDING REGIME OF *Ficus sycomorus* LEAVES ON PERFORMANCE OF YANKASA RAMS FED *Digitaria smutsii* AS BASAL DIET

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ABSTRACT

The study was conducted to determine the effect of inclusion level and feeding regime of *Ficus sycomorus* (Baure (Hausa, Northern Nigeria), Tarmu (Kanuri), and Kamda (Babur/Bura)) on the performance of Yankasa ram. A total of 36 healthy rams were used for the study. Four complete diets were formulated to contain 16% crude protein with each diet containing 0, 5, 10, and 15% inclusion levels of *Ficus sycomorus*. Each animal was fed at 2% body weight of the experimental feed on daily, skip-a-day and skip-2-days feeding regimes for a period of 91 days. Total feed intake, average daily weight gain, total weight gain were observed. The result showed that rams fed 10% inclusion level of *Ficus sycomorus* performed better in terms of weight gain and average daily gain (3.54kg and 39.78g/day, respectively). Skip-a-day feeding frequency also improved total dry matter intake, weight gain and average daily weight gain (202.09kg, 2.82 and 30.10g/day, respectively) than other feeding regimes. Dry matter intake was significantly improved ($p<0.05$) at skip-2-days feeding regime. Overall interaction at 0, 5, 10 and 15% inclusion levels of *Ficus sycomorus* (855.49kg, 865.97kg, 856.97kg and 846.92kg, respectively) had the highest compared to other interactions between feeding regime and inclusion levels of *Ficus sycomorus*. The total weight gain was significantly ($p<0.05$) higher in skip-a-day feeding regime (2.96kg, 3.11kg, 3.51kg and 2.90kg, respectively) at 0, 5, 10 and 15% inclusion levels of *Ficus sycomorus* compared with other feeding regimes, while Skip-a-day at 10% inclusion of *Ficus sycomorus* had the highest (38.57g/day) average daily weight gain as compared with others. It can be concluded that inclusion of *Ficus sycomorus* leaves in the diet of Yankasa rams up to 10% improved the performance of the animals and skip-a-day feeding frequency gave better performance in terms of weight gain and average daily gain.

Key words: *Ficus sycomorus*, Yankasa Rams, Feeding regime, Performance, *Digitaria smutsii*

INTRODUCTION

Small ruminants (sheep and goats) in the humid zones of West Africa roam around and eat natural pastures and kitchen wastes which contain low crude protein, high fibre and lignin contents (Tchinda *et al*., 1993; Aregheore, 2000). The low nutritional plane greatly hampers the productivity of these animals especially during the dry season of the year when the crude protein content of the feedstuffs could be as low as 2%CP (Sarwatt *et al*., 2004). This leads to slow growth rate, loss of body weight, low birth weight, predisposition to diseases as well as maternal and child death. A balance of protein and energy with other essential nutrients is required to improve the productivity of small ruminants (Mendietta-Araica *et al*., 2010).

The ever increasing human population is heavily dependent on the available grain for consumption thereby making them increasingly less available for livestock use (Alawa and Umunna, 1993). Hence, there is a need to supplement the diet of

small ruminants with alternative feed ingredients. One of such feed ingredient is the leaves of *Ficus sycomorus* tree. Efficient supplementation of locally mixed concentrates with protein foliages has been demonstrated to improve rumen ecology, dry matter intake and subsequently, meat and milk quality and quantity (Wanapat, 1999).

Ficus sycomorus is a large, semi-deciduous spreading tree plant of the savannah region. Its leaves are excellent fodder for livestock. The leaves are readily available and cheap especially during the dry season when most other forages are in short supply. Well dried leaves of *Ficus sycomorus* can be stored for a long time. Efficient supplementation of locally mixed concentrate diets with protein foliages has been shown to improve dry matter intake, rumen ecology and subsequently, meat and milk quality and quantity (Wanapat, 1999).

The objective of the study was to evaluate the varying inclusion levels and feeding regime of *Ficus sycomorus* leaf meal on performance of Yankasa rams fed *Digitaria smutsii* hay as basal diet.

MATERIALS AND METHODS

Experimental Site

The study was conducted at the Teaching and Research Farm of the Department of Animal Science, Ahmadu Bello University, Samaru Zaria. The area lies within the Northern Guinea Savannah zone of Nigeria and is situated on latitude 11^0 11'N and longitude $07^0 38^{'}$E and at an altitude of 686m above sea level. The mean relative humidity is 21 and 72% during the harmattan and rainy seasons, respectively (Ovimaps, 2012).

Source of Experimental Materials

The leaves of *Ficus sycomorus* was collected from the Institute for Agricultural Research (IAR), Ahmadu Bello University, Samaru Zaria. The leaves were shade-dried for 10 days, milled, packaged and stored until required for feed formulation and laboratory analysis. *Digitaria smutsii* hay was obtained from the National Animal Production Research Institute (NAPRI), Shika- Zaria, Kaduna State.

Experimental Diet

Four experimental diets were formulated to contain 16% crude protein with each diet containing different inclusion levels of *Ficus sycomorus* leaves. The composition of the experimental diets is shown on Table 1. Other ingredients used for the ration formulation include: maize offal, cotton seed cake (CSC), rice bran, bone meal and common salt.

Experimental Animals, Design and Management

Thirty six (36) Yankasa rams were purchased from the open market in Giwa. The rams were randomly allotted to four dietary treatments of nine animals each in a 4x3 factorial design in a Completely Randomized Design (CRD). Each animal was fed 2% body weight of the concentrate mixture in the morning at the stipulated days. The animals were individually penned and given the formulated diets containing Ficus *sycomorus* leaf meal at inclusion levels of 0, 5, 10 and 15% and a feeding regime of daily, skip-a-day and skip-two-days. *Digitaria smutsii* hay was also offered as basal diet. The animals were adjusted for a period of 2 weeks after which the feeding trial was conducted which lasted for 12 weeks. Drinking water was provided daily *ad libitum.*

Experimental Diets

Treatment 1 (containing 0% FSLM): feeding times (daily, skip-a-day, skip-2-days), 3 animals/treatment.

Treatment 2 (containing 5% FSLM): feeding times (daily, skip-a-day, skip-2-days), 3 animals/treatment

Treatment 3 (containing 10% FSLM): feeding times (daily, skip-a-day, skip-2-days), 3 animals/treatment

Treatment 4 (containing15%): 3 feeding times (daily, skip-a-day, skip-2-days), 3 animals/treatment.

Statistical Analysis

All data collected were subjected to One-Way Analysis of Variance (ANOVA) using the General Linear Model Procedure (GLM) of Statistical Analysis System (SAS, 2002). Significant means were compared using Duncan's Multiple Range Test (Duncan, 1955).

Table 1: Ingredient composition of supplementary diets fed to Yankasa rams

	Inclusion levels of *Ficus sycomorus* leaf meal (%)			
Ingredients	**0**	**5**	**10**	**15**
Maize Offal	64.00	60.10	56.10	51.90
FSML	0.00	5.00	10.00	15.00
Cotton Seed Cake	18.00	16.90	15.90	15.10
Rice Bran	15.00	15.00	15.00	15.00
Bone Meal	2.00	2.00	2.00	2.00
Table Salt	1.00	1.00	1.00	1.00
Total	100.00	100.00	100.00	100.00

FSML = *Ficus sycomorus* leaf meal

RESULTS AND DISCUSSION

Chemical composition of supplementary diets, *Ficus sycomorus* leaf meal and *Digitaria smutsii* hay

The chemical composition of the supplementary diets, *Ficus sycomorus* leaf meal and *Digitaria smutsii* hay are shown in Table 2. The dry matter (DM) content of *Ficus sycomorus* leaf meal varied between 92 and 95%. This was similar with the findings of Njidda *et al.* (2010) who reported a DM of 95.60%. The CP contents of *Ficus sycomorus* leaf meal in this study (8.56%) are lower than the 14.90% reported by Njidda *et al*. (2010) and 11.38% reported by Abdu *et al*. (2012). The differences observed in this study could be due to environmental differences and time of harvest which was reported (Ibrahim *et al.*, 1988) to influence the chemical composition and digestibility of forages grown in different locations. Also, the variation in the CP content might be attributed to the differences in soil on which the forages were cultivated. Njidda *et al.* (2010) reported that browses plants such as *Ficus polita, Ficus thonningii and Khaya senegalensis* had above 13%CP content which is an indicator that most tropical browse species are high in CP content and can be used to supplement poor roughage to increase productivity for ruminant livestock in tropical region. The *F. sycomorus* leaf meal used in this study had higher (18.19%) crude fibre (CF) content compared to the 16.26% reported by Abdu *et al*. (2012). One of the characteristics of

most browse leaves is that they have relatively high CF value which could be attributed to the high cell-wall constituents usually present in the leaf meal., as this is one of this study recorded ash content of 7.22% in the *F. sycomorus* leaf meal whichwas similar to those reported by (Abdu *et al*., 2012; Nguyen and Le Duc, 2003; Kwabiah *et al.*, 2003).

Table 2: Chemical composition of supplementary diets, *Ficus sycomorus* leaf meal and *Digitaria smutsii* hay

Parameters	**Inclusion levels of *Ficus sycomorus* leaf meal (%)**					
	0	**5**	**10**	**15**	**FSLM**	***Digitaria smutsii***
DM	92.67	93.13	94.88	93.50	89.56	90.04
CP	17.36	16.98	17.04	16.89	8.56	5.36
CF	14.21	12.80	13.11	12.11	18.19	30.05
EE	3.58	2.96	3.29	3.13	4.42	0.54
NFE	61.59	63.13	62.07	64.35	61.61	61.40
Ash	3.26	4.13	4.81	3.38	7.22	2.65
NDF	34.61	37.50	37.73	38.88	63.81	69.23
ADF	18.00	20.75	21.05	21.42	33.94	38.88
Lignin	7.84	8.69	7.01	8.47	7.02	20.40

DM=Dry Matter, CP=Crude Protein, CF=Crude Fibre, EE=Ether Extract, NFE=Nitrogen Free Extract, NDF=Neutral Detergent Fibre, ADF=Acid Detergent Fibre, FSLM= *Ficus sycomorus leave meal*

Level of Antinutritional Factors in Supplementary Diets and *Ficus sycomorus* leaf meal

Table 3 shows the levels of antinutritional factors in the supplementary diets of *Ficus sycomorus* leaf meal. The levels of phytate, oxalate, hydrogen cyanide (HCN) and tannin increased in the diet with increased levels of *Ficus sycomorus* leaf meal. The study revealed that *Ficus sycomorus* leaf meal contained 2.25% phytate, 2.12% oxalate, 4.32% HCN and 14.61% tannin. These were within tolerable levels for ruminants as reported Kumar (1991). Studies have shown that phytic acid is a potent chelating agent for divalent cations (such as: Ca, Mg, Fe and Zn) and consequently, interfere with mineral bioavailability. Oxalate tends to render calcium unavailable by binding to the calcium ion to form complexes (calciumoxalate crystals). These oxalate crystals formed prevent the absorption and utilization of calcium. The calcium crystals may also precipitate around the renal tubules thereby causing renal stones (Ladji *et al*., 2004; Nkafamiya *et al*., 2006). However, the tannin brings about their anti-nutritional influence, especially in non-ruminant, largely by bonding dietary protein and digestive enzymes into complexes, which are not readily digestible (Agbede and Ibitoye, 2007).

Table 3: Level of Antinutritional factors in supplementary diets and *Ficus sycomorus* leaf meal

Parameters	**Inclusion levels of *Ficus sycomorus* leaf meal (%)**				
	0	**5**	**10**	**15**	**FSLM**
Phytate (mg/100g)	5.26	5.56	6.010	6.91	2.25
Oxalate (mg/100g)	7.04	7.26	7.48	7.92	2.12
HCN (mg/100g)	2.86	3.78	3.79	4.59	4.32
Tannin (mg/100g)	0.85	1.00	1.35	1.35	14.61
Saponin (%)	8.26	7.96	9.22	8.84	8.19

HCN=Hydrogen cyanide, FSLM= *Ficus sycomorus*

Effect of Inclusion Levels of *F. sycomorus* on Feed Intake and Weight Gain of Growing Yankasa Rams fed *D. smutsii* Hay

The effect of feeding varying inclusion levels of *F. sycomorus* leaf meal on feed intake and weight gain of growing Yankasa ram fed *D. smutsii* hay is shown in Table 4. The total feed intake was significantly (P<0.05) different across treatments. Animals fed *F. sycomorus* at 0% inclusion level (the control diet) had significantly (P<0.05) higher (208.40kg) feed intake, while those on 15% inclusion level had the lowest (190.76kg). The total feed intake of animals on 5 and 10% inclusion levels were similar (201.74 and 201.23kg, respectively). The decrease in feed intake with increase levels of *Ficus sycomorus* in the diets may be as a result of decrease in the palatability of the supplement.This pattern was also observed by Abdu *et al*. (2012). Final weight and total weight gain was significantly (P<0.05) influenced by the levels of *Ficus sycomorus* in the diet. Animals fed FSLM at 10% inclusion level had highest (18.90 and 3.54kg) final weight and total weight gain, respectively. While those on 0, 5 and 15% inclusion levels recorded the least values statistically.

Table 4: Effect of Inclusion levels of *F. Sycomorus* leaf mealon growth performance of growing Yankasa rams fed *D. smutsii* hay.

Parameters	***F. sycomorus* inclusion levels (%)**				**SEM**
	0	**5**	**10**	**15**	
Dry matter intake (kg)					
Supplement	195.26^{a}	189.43^{b}	189.09^{b}	178.82^{c}	2.43
Digitaria smutsii hay	14.14^{a}	12.31^{b}	12.14^{b}	11.94^{b}	0.38
Total intake	208.40^{a}	201.74^{b}	201.23^{b}	190.76^{c}	2.98
Initial weight (kg)	15.39	15.33	15.40	15.44	0.21
Final weight (kg)	17.56^{b}	17.49^{b}	18.94^{a}	18.01^{b}	0.44
Total weight gain (kg)	2.17^{b}	2.16^{b}	3.54^{a}	2.57^{b}	0.35
ADG (g/day)	24.38^{c}	24.27^{c}	39.78^{a}	28.88^{b}	2.01

^{abc}means with different superscripts within the row differed significantly (p<0.05); SEM=Standard Error of Mean, ADG=Average Daily Gain

The effect of feeding regimes on feed intake and weight gain of Yankasa rams fed *D. smutsii* hay supplemented with concentrate containing varying inclusion levels of *F. sycomorus* is shown in Table 5. There was significant (P<0.05) difference in the dry matter intake and total weight gain across the dietary treatments. The results showed that rams on daily and skip-a-day feeding regimes had significantly (P<0.05) similar and higher (199.48 and 202.09kg) total dry matter intake, respectively than animals fed skip-2-days feeding regime (196.92kg).The result agrees with earlier study by Ikemefuna *et al*. (1991) who reported increased DM intake with increased feeding frequency. The total weight gain of the animals fed skip-a-day feeding regime was significantly (P<0.05) higher (2.82kg) than the weight gain recorded in animals on daily feeding (2.11kg), and skip-2-days (1.98kg), respectively.. The low weight gain observed in animals on skip-2-days feeding regime may be as a result of low DM intake. Average daily weight gain (ADWG) was significantly (P<0.05) affected by the different feeding regimes. Animals on skip-a-day feeding regime had higher (30.10kg ADWG) than animals on daily and skip-2-days (20.01 and 20.00, respectively). This may be as a result of higher feed intake observed in the skip-a-day feeding. The result obtained in this study was in agreement with the findings of Schrutz *et al*. (2007) who reported greater weight gain and average daily weight again at skip-a-day feeding of steers supplemented at three different feeding frequencies.

Table 5: Effect of feeding regime on growth performance of Yankasa rams fed varying inclusion levels of FSLM and *D. smutsii* hay.

Parameters	Feeding regimes			SEM
	daily feeding	skip-a-day	skip-2-days	
Dry matter intake (kg)				
Supplement	188.48[a]	186.28[a]	178.32[b]	3.12
Digitaria Smutsii	11.00[c]	14.21[b]	18.60[a]	1.04
Total Dry Matter Intake	199.48[a]	202.09[a]	196.92[b]	2.07
Initial weight (kg)	15.67	15.25	15.33	0.43
Final weight (kg)	17.78[b]	18.07[a]	17.31[c]	0.11
Total weight gain (kg)	2.11[b]	2.82[a]	1.98[b]	0.29
ADG (g/day)	20.01[b]	30.10[a]	20.0[b]	3.42

[abc]means with different superscripts within the row differed significantly(p<0.05): SEM=Standard Error of Mean, ADG=Average Daily Gain.

CONCLUSION

It was concluded that inclusion of *Ficus sycomorus* leaves in the diet of rams up to 10% improved the performance of the animals in terms of weight gain, total feed intake and average daily gain. Also, skip-a-day feeding frequency improved total dry matter intake and weight gain.

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