FIBRE INTAKE BY YANKASA RAMS FED COWPEA HAY AND GROUNDNUT HAULMS AS SUPPLEMENTS TO BASAL RICE STRAW

***Dan Abba Y.U.,[1] Maigandi, S.A.,[2] Ashiru, R.M.,[3] Garba, M.G.[1] Abdullahi, A.Y.[3] & Yusuf, A.[1]**
1. Department of Animal Science, Federal University, Dutsin Ma, Katsina, Nigeria.
2. Department of Animal Science, Usmanu Danfodio University, Sokoto, Nigeria.
3. Department of Animal Science, Kano University of Science and Technology, Wudil, Nigeria
*Corresponding Author: udyusuf@fudutsinma.edu.ng

ABSTRACT
Nutrients deficiencies associated with poor digestibility negatively affects growth performance of ruminants. The study was conducted to assess the influence of cowpea hay and groundnut haulms supplementation on fibre intake in growing Yankasa rams. Sixteen (16) Yankasa rams weighing averagely 20.19 ± 2.2 kg were randomly assigned to four treatments viz, rice straw (Treatment I), groundnut haulms (Treatment II), cowpea hay (Treatment III) and combination of cowpea and groundnut haulms supplementations (Treatment IV) in a Completely Randomized Design (CRD) with four (4) replications. The animals were fed experimental diets, concentrate at 1.5% body weight and supplements while rice straw was fed as basal diet *ad libitum* to all the experimental animals, the experiment lasted for 84 days. The results for fibre intakes revealed significant ($P<0.05$) differences in all the parameters evaluated except concentrate lignin. intakes values of the treatment groups were significantly ($P<0.05$) higher than the controls. Significant ($P<0.05$) differences were observed for treatments groups in cellulose and hemicellulose compared to control. Similarly, significant difference ($P\leq0.05$) was found in growth performance among the treatments in terms of final body weight, weight gain, feed conversion ratio, supplement and roughage intakes. With the exception of roughage intake, the cowpea haulms supplemented group was found to have the highest values of 8.88kg. 8.63kg, 6.36 and 388.43 g/day, respectively. The findings from this study implied that, supplementation of cowpea and groundnut haulms to basal rice straw enhanced fibre intake with subsequent improvement of growing Yankasa rams.
Key Words: Cowpea hay, groundnut haulms, rice straw, supplementations, fibre intake

INTRODUCTION
Fibre is an estimate of cell wall polysaccharides. It is usually determined as the residue after extraction of the feed successively with a solution of acid and alkali or the residue after extraction with neutral detergent or with acid detergent and is termed neutral detergent fibre (NDF) or acid detergent fibre (ADF) (Goering and Van Soest, 2006) respectively. Fibre is essential to maintain the animal health and is required to maintain an appropriate rumen function and physiology (Aghsaghali *et al.*, 2011). Nutritionally, fibre has both physical and chemical attributes that are related to the mechanical processes of digestion (chewing and passage) and to enzymatic degradation associated with fermentation.

Previous studies by Mokoboki *et al.* (2000) and Anele *et al*. (2010) indicated that cowpea (*Vigna unguiculata* L.Walp) haulm can be utilized as a supplement for ruminants in the dry season. Moreover, Osafo *et al.* (2013) reported improved intake and digestibility of poor quality fodder with supplementation of cowpea haulm. According to Abdou *et al.* (2011), positive live weight gains were found in sheep when supplemented with groundnut (*Arachis hypogaea* L.) haulm. This study therefore was aimed at evaluating the influence of haulms of groundnut and cowpea supplementations on basal rice straw on growth performance and fibre intake in yankasa rams.

MATERIAL AND METHODS
Study Location: The study was conducted at the Small Ruminant Unit, Department of Animal Science, Kano University of Science and Technology, Wudil, Kano State (Latitude 11º 5´N and longitude 9º 40´E and on an elevation of 415m, above sea level) (Adamu *et al.,* 2014).

Sources of Experimental Feeds: Cowpea hay and groundnut haulms were purchased from Wudil market, Kano state. They were bagged separately in clean sacks and labelled accordingly. The rice straw was obtained from a rice farm at Wudil town, Kano. The rice straw was chopped using a forage chopper to size of 4 cm length and bagged. Other feed ingredients were purchased from the same market. All the experimental feeds were bagged properly and stored until required for use.

Experimental Animals: Sixteen (16) growing Yankasa rams weighing averagely (20.19 ±2.2kg) were purchased from Wudil Market, Kano State for the experiment. The animals were quarantined for a period of

two weeks. The animals were dewormed against internal and external parasites using Ivomec® Super at 200µg/kg body weight prior to experiment.

Experimental Treatments and Design: The experimental Yankasa rams were randomly divided into four groups (I-IV). The experiment was laid down in a Completely Randomized Design (CRD) with four (4) replications. To the first group (Treatment I), rice straw was offered *ad libitum* as control. The second group (Treatment II) received groundnut haulms at 300g /day and rice straw *ad libitum*. Treatment III was given 300g /day cowpea hay and rice straw *ad libitum.* Treatment IV was a combination of groundnut haulms with cowpea hay (150g/day Groundnut haulms + 150g/day Cowpea hay) + and rice straw offered *ad libitum*.

Feeding and Management: The experimental animals were fed wheat bran and rice straw for two (2) weeks during the period of adaptation. The experimental animals were balanced by weight before being allotted to the treatment groups and were divided into four (4) groups of four (4) animals each with each one serving as replicates. A concentrate diet containing wheat bran (WB) and sorghum chaff mixed in a ratio 2:1 were mixed and given at 1.5% body weight to all the experimental animals once daily. The experimental diets were given twice a day in the morning at 8:00 am after concentrates feeding and afternoon at 4:00 pm while rice straw was fed *ad libitum* to all the experimental animals.

Data Collection: The experimental animals were weighed individually prior to the commencement of the experiment and subsequently at weekly intervals between 8:00am and 10:00am before offered feed. Daily records of growth performance and feed intake were taken throughout the period of the experiment by weighing feed offered and left over the following day. Fibre intakes were calculated as the amount of fibre in feed after chemical analysis multiplied by feed intake. The feeding trial lasted for 12 weeks.

Statistical Analysis: The data collected were subjected to Analysis of Variance (ANOVA) using SAS (2004) version 9.1; where there is significant difference, the means were separated using Least Significant Difference (LSD) at 5% level of probability.

RESULTS AND DISCUSSION

The influence of cowpea hay and groundnut haulms as supplements to basal rice straw on growth performance by Yankasa rams is shown in Table 1. The results showed that there were significant ($P<0.05$) differences between treatment means in all the parameters evaluated except concentrate intake (CI) and feed efficiency (FE) for CI. Final body weight values 28.00kg (TII) and 28.88kg (TIII) were significantly ($P<0.05$) higher than values obtained in other treatments, followed by the value obtained in treatment IV, the value recorded for the control was significantly ($P<0.05$) lower. The results for weight gain values recorded in the present study followed the same pattern as final weight gains and average daily gain (ADG). There were improvements in the growth performances in all the experimental animals fed basal rice straw supplemented with cowpea hay and groundnut haulms. This means that, intake of rice straw increases when supplemented with leguminous crops residues. This finding is in line with that of Musa (2016) who reported that, total feed intake generally increased with increasing level of legumes supplementation. The high average daily weight gain of Yankasa rams fed diets supplemented with cowpea hay can be attributed probably to the adequate energy and protein provided which are critical for their growth. This finding agrees with that of Adamu (2015) who reported average daily weight gain of Yankasa rams fed with graded levels of groundnut haulms supplementation to be 150 g/day. The total feed intake was higher in experimental animals fed with cowpea hays (Treatment III) supplemented diets and lower in a combined treatment group (Treatment IV). The higher feed intake observed on animals fed with cowpea hay supplementation could be an indication of increased palatability of cowpea to Yankasa rams. This is in consistence with the previous work of Nuwam (2015) who reported supplementation with legume forage significantly enhance feed intake in ruminants such as red Sokoto does. Also, groundnut supplementation enhances feed intake and performance of ruminants as stressed by Okafor *et al*. (2012).

Table 1: Growth Performance of Yankasa fed Cowpea hay and Groundnut haulms as Supplements to Basal Rice Straw

	TREATMENTS				
Parameters	I	II	III	IV	SEM (±)
Initial Body Weight (kg)	20.25	20.00	20.25	20.25	1.74
Final Body Weight (kg)	25.50^{c}	28.00^{a}	28.88^{a}	27.00^{b}	2.25
Weight Gain (kg)	5.25^{c}	8.00^{a}	8.63^{a}	6.75^{b}	1.31
Average Daily Gain (g/day)	62.50^{c}	95.24^{a}	102.74^{a}	80.36^{b}	0.02
Concentrate Intake (g/day)	377.26	458.87	415.79	391.67	51.39
Supplement Intake (g/day)	0.00^{d}	131.94^{b}	388.43^{a}	126.38^{c}	23.77
Roughage Intake (g/day)	327.96^{a}	54.98^{c}	63.84^{b}	49.47^{d}	42.23
Total Feed Intake (g/day)	710^{b}	650^{c}	870^{a}	570^{d}	0.21
Feed Conversion Ratio	8.69^{a}	5.40^{c}	6.36^{b}	5.74^{c}	1.04
Feed Efficiency	0.12	0.20	0.16	0.19	0.03

KEY: ^{abcd} Means with the same superscript within the same row are not significantly ($P<0.05$) different
I= Rice Straw II= Groundnut Haulms III= Cowpea Hay IV= Cowpea + Groundnut Hay

The results of fibre intakes were presented on Table 2. The results for Fibre intakes revealed significant ($P<0.05$) differences in all the parameters evaluated except concentrate lignin. All fibre intake values were significantly ($P<0.05$) higher for treatment IV compared to other treatments. Significant ($P<0.05$) differences were observed for treatments group in cellulose and hemicellulose compared to control. The NDF and ADF values of rice straw in this study were higher than those of cowpea hay and groundnut haulms. This can probably be due to the fact that, rice straw as a cereal residue contains high concentration of neutral detergent fibre and acid detergent fibers compared to the legumes. Similarly, Belewu *et al*. (2010) asserted that, moderate values of NDF and ADF make more energy available to ruminants. Brandi (2022) reported that, energy and protein are often the major focus of many ruminants nutritional programs, fiber is another essential diet component mutton/beef producers need to consider. Fiber type, quality, and length impact ruminants health and productivity. Fiber is typically coarse and less dense than other feedstuff components, and the positive effects of feedstuffs on rumen health are related to their fiber content. The differences observed in the fibre intakes in the present study between the treatments could be as a result of palatability of the experimental materials. . Total fibre intake generally increased with increasing level of cowpea hay and groundnut haulms supplementation.

Cellulose contents of ADF, NDF and ADL intakes all increased due to supplements level. This finding agrees with the finding of Koralagama *et al.* (2008) who reported increased in feed intake with supplementation of cowpea hay to basal diet of maize stover. The values of NDF, ADF and ADL obtained in the present study were lower than that of what Fajemisi (2018) obtained for West African Dwarf rams fed untreated and Alkali treated bush forage. The mean values obtained in this study for NDFI and ADFI were lower than the values reported by Nisa *et al.* (2015). Similarly, Bodas *et al.* 2010 reported increase in NDF Digestibility and ADG with fibre intake. Moreover, greater amount of NDF induce changes in the molar proportion of major volatile fatty acid and bring about a lower efficiency of utilization of metabolizable energy as stress by Normand *et al*. 2001.

Table 2: Fibre intake by Yankasa rams fed cowpea hay and groundnut haulms as * supplements to basal rice straw

Parameter	I (RS)	II (GNH)	III (CPH)	IV (GNH+CPH)	SEM (±)
Roughage NDF	217.73^{d}	259.76^{b}	238.14^{c}	264.26^{a}	0.87
Concentrate NDF	45.11^{a}	44.20^{a}	46.81^{a}	44.25^{a}	0.55
Total NDF	262.84^{c}	303.96^{a}	284.95^{b}	308.51^{a}	9.10
Roughage ADF	203.81^{c}	201.76^{c}	217.91^{b}	256.96^{a}	1.30
Concentrate ADF	20.94^{b}	24.35^{b}	26.75^{a}	29.60^{a}	1.59
Total ADF	224.75^{c}	226.11^{c}	244.66^{b}	286.56^{a}	12.485
Roughage Lignin	67.02^{b}	105.76^{a}	115.95^{a}	67.02^{b}	1.53
Concentrate Lignin	6.130	5.31	6.45	9.31	0.754

Total Lignin	73.15[b]	111.07[a]	122.40[a]	76.33[b]	10.83
Roughage Cellulose	136.79[b]	96.0[c]	101.96[c]	189.94[a]	18.67
Concentrate Cellulose	14.81[b]	19.03[a]	20.30[a]	20.29[a]	1.125
Total Cellulose	151.6[b]	115.03[c]	122.26[c]	210.23[a]	18.75
Roughage Hemicellulose	13.92[b]	58.00[a]	20.23[b]	7.30[c]	9.835
Concentrate Hemicellulose	24.17	19.85	20.06	14.65	1.689
Total Hemicellulose	38.09[b]	77.85[a]	40.29[b]	21.95[c]	10.245

KEY: [abcd] Means with the same superscript within the same row are not significantly different (P≤0.05)
I= RS/Rice Straw II= Groundnut Haulms III= Cowpea Hay IV= Cowpea + Groundnut Hay
RS: Rice Straw GNH: Groundnut Haulm CPH: Cowpea Hay GNH+CPH: Groundnut Haulm+Cowpea Hay

CONCLUSION

It was concluded that cowpea hay and groundnut haulms supplementation improved the fibre intake and growth performance of Yankasa rams by 8.63 kg and 8.0 kg respectively in comparison to 5.25 kg of the control. The feed-to-gain ratio was lowest among treatments supplemented with cowpea hay and groundnut haulms; indicating that animals in these treatments were more efficient in feed utilization.

REFERENCES

Abdou, N., Nsahlai, I. V. and Chimonyo, M. (2011). Effects of groundnut haulms Supplementation with millet stover on intake, digestibility and growth performance of lambs. *Animal Feed Science and Technology*, 169 (3-4): 176-184.

Adamu, U.K., Muhammad, A. and Adam, J.A. (2014). Evaluation of soil reaction, exchangeable acidity and cation exchange capacity of soil from Kano University of Science and Technology Wudil, Teaching, Research and Commercial farm, Gaya. *Bayero Journal of Pure and Applied Science*, 83: 320–332.

Adamu, Y.H. (2015). Assessment of two groundnuts (*Arachis hypogaea* L.) varieties for forage, pod yield characteristics and effect of feeding the haulm to Yankasa rams. A Ph. D Thesis (Unpublished), Ahmadu Bello University, Zaria, 1– 143 pp.

Aghsaghali, M. A. Maheri-Sis, N. (2011). Importance of 'physically effective fibre' in ruminant nutrition: A review. Ann Biol Res.2:262-270.

Anele, U.Y., Arigbede, O. M., Sudekua, K.H, Ikb, K. A, Onc A. O., Ojanith J. A, Amole G. A., Dele, P. A. and Jolaosho, A. O. (2010). Effects of processed cowpea (*Vigna unguiculata*) haulms as a feed supplement on voluntary intake, utilization and blood profile of west Africa dwarf sheep feed a basal diet of *Pennisetum purpureum* in the dry season. *Animal Feed, Science and Technology*, 159:10 – 17

Belewu, M A. Belewu, K.Y. and Ogunsola, F.O. (2010). Nutritive value of dietary Fungi treated *Jatropha curcas* Kernel cake. Voluntry intake growth and digestibility coefficient of goats. *Agric*., *Biology Journal of North America*. 1(2): 135 – 138

Bodas, R. López, S. Rodríguez. A. B. Andrés, S. Mantecón, A. R. Giráldez. F.J. (2010). Feed intake, digestibility, and carcass characteristics of lambs fed a diet supplemented with soluble fibre. *Animal Production Science*

Brandi, K. (2022). Fibre in beef Cattle Diets. Cattle 7th Edition, 1996, update 2000. National Academy Press Washington D.C, Copyright 2022 by Mississipi State University.

Fajemisi, A. M. (2018). Performance of West African Dwarf Rams fed untreated and Alkali treated bush Foggage. *Applied Tropical Agriculture Volume* 23 (2): 1-6

Georing, H.K. and Van Soest, P.J. (2006). *Forage fiber analysis* (apparatus, reagent procedures and some application). Agriculture handbook, No 379, US Department of Agriculture, Washington, USA., 1-20 pp.

Koralagama, K. D. N., Mould, F. L. Fernandez-Rivera, S. and Hanson, J. (2008). The effect of supplementing maize stover with cowpea hay on the intake and the growth performance of Ethiopian sheep. *Animal*, 2: 954 - 961.

Mokoboki, H. K., Ayisi, K. K. and Ndlovo, L. R. (2000). Chemical composition and physical characteristics of cowpea hay as forage for ruminants. *South African Journal of*

Animal Science, 30 (1): 87-88.

Musa, A., (2016). Performance of Yankasa rams offered cowpea haulms as supplements at different levels and frequency to a basal diets of sorghum stover. A Ph.D Thesis (Unpublished). Department of Animal Science, Ahmadu Bello University, Samaru Zaria Nigeria. February 2016. Pp 19-141.

Nisa, M. Sarwar, M. Shahzad, M. A. and Hassan, Z. (2015). Influence of urea-molasses treated wheat straw fermented with cattle manure on nutrient intake, digestibilities, milk yield and its composition in early lactating Nili Ravi buffaloes. *Italian Journal of Animal Science,* 6(2), 480-483

Normand, J. Theriez. M, Bas, P. Berthelot. V, Aurousseau. B, Sauvant, D. (2001). Effect of the 365 type of concentrate, cereals vs sugar beet pulp, on rumen fermentation, plasma 366 concentration of methylmalonate and quality of subcutateous adipose tissue of intensively 367 reared lambs. *Animal Research* 50, 275-288.

Nuwam, J. (2015). Comparative study on the utilization of groundnut haulms and cowpea husks by lactating red sokoto does fed *Digitaria smutsii* basal diet. M.Sc. Dissertation (Unpublished), Department of Animal Science, Faculty of Agriculture, Ahmadu Bello University, Zaria, Nigeria, pp: 1–82.

Okafor, E.C., Lakpini, C.A.M. and Fayomi, A. (2012). Dried Gmelina *(Gmelina arborea Roxb)* leaves as replacement forage to groundnut haulms in the diet of fattening Red Sokoto Bucks. *International Journal of Agriculture and Biosciences*, 1(1): 5–1.

Osafo, E. L. K, Antwic Donkoh, A. and Adu-Dapaah, H. (2013). Feeding graded levels of an improved cultiva haulms as supplement for Rams fed maize stover diet. *International Journal of Agricultural Research, 8(2): 87 – 93*

S.A.S (2004) SAS/STAT Guide to Personal Computets, Release 9.0. Statistical Analysis System institute. Inc, NC. North Carolina USA.