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PERFORMANCE OF YANKASA RAMS OFFERED A BASAL DIET OF PANGOLA GRASS HAY SUPPLEMENTED WITH DIFFERENT SUPPLEMENTS IN THE SEMI-ARID ZONE OF NORTH EAST OF NIGERIA

¹Nyako, H. D., ^{*3}Malgwi, I. H., ²Kibon, A., ¹Yahya, M. M., ⁴Abdullahi, S., ⁵Aminu, I. M., and ⁴Gabdo, I. I.

¹Department of Animal Science and Range Management, Modibbo Adama University of Technology, P.M.B.2076, Adamawa State – Nigeria

²Department of Animal Science, Federal University Dutse, P.M.B 7156, Jigawa State, Nigeria

^{3,*}Department of Animal Science, Faculty of Agriculture, University of Maiduguri, P.M.B 1069, Borno State, Nigeria

⁴Ministry for Livestock and Nomadic Settlement, Adamawa State, Nigeria

⁵Department of Agriculture, Taraba State College of Agriculture, Jalingo, Nigeria

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ABSTRACT

The research was conducted at the Department of Animal Science Teaching and Research Farm, Modibbo Adama University of Technology, Yola, Nigeria. A total of 12 Yankasa rams aged 6-12 months of age weighing 18.5-21.5kg were used. The rams were randomly divided into 4 treatments of 3 animals/treatment in a completely randomised design (CRD). The treatments were: T1 (Grass hay only *adlib*, control), T2 (Grass hay *adlib* + 300g Cotton Seed cake), T3 (Grass hay *adlib* + 300g brewers waste) and T4 (Grass hay *adlib* + 300g maize bran). One of the problems of small ruminants' production in the tropics is inadequate quantity and quality of feeds during the dry season which lead to reduced feed intake and weight loss. Therefore supplementation of basal feeds increases feed intake and reduce loss weight of the animals. The research aimed at evaluating the dry matter intake, water intake, live weight gain and appropriate feed combinations for feeding small ruminants in the Semi-arid zone of North East of Nigeria. The research lasted for 74 days plus adjustment period of two weeks. Results showed the highest dry matter intake (942.7g/animal/day) was recorded in rams fed grass hay supplemented with cotton seed cake while the lowest (801.77 g/animal/day) was obtained in rams fed grass hay only. The DMD ranged from 57.8% - 62.6%, CPD varied from 63.03%-68.0% and CFD ranged from 44.9-53.7%. The highest live weight gain (66.1 g/animal/day) was recorded in those rams that were fed grass hay supplemented with cotton seed cake. Water intake ranged from 2.36 – 2.6 litre/animal/day. Pangola grass hay supplemented with cotton seed cake is highly recommended for feeding small ruminants in the zone because these feed combinations gave highest dry matter intake and live weight gain.

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INTRODUCTION

Scarcity of feed resources especially in the dry season of the year has been a major limiting factor in livestock production especially ruminants production. The Savanna zone of West Africa is a suitable environment for livestock production but the low yields of the indigenous fodder species from native rangelands and seasonal bush fires make year round fodder

availability one of the factors limiting livestock production Mohammed *et al.*, 2015. In the Savannah zone in Nigeria the basal diets of most ruminants in the dry season is based on crop residues and dry standing grasses, most of the diets are imbalanced in nutritional value and vary from year to year (Zemmelink, 1999). In order to develop a sustainable ruminant production system, efforts should be directed to making the best use of local resources by adjusting the production system according to local conditions. The use of appropriate supplements and basal diets is a fundamental component of the feeding strategy in order to balance nutrients at the level of

***Corresponding author: Malgwi**

Department of Animal Science, University of Maiduguri, P.M.B 1069, Borno State Nigeria

rumen and the animal (Lakpini, 2002). Little information is available on appropriate feed combinations of variety of basal diets and supplements to ruminants in the zone. Due to the high cost of treatment of cereal crop residues with chemicals to improve their nitrogen content and its associated risks, and the reluctance of the local farmers to adopt the technology (Kiangi *et al.*, 1981), it has become very important to supplement Pangola grass hay as basal. The basal diet used in this experiment is cheap and readily available in the Zone. The seasonal effect (long dry season November – June) on native forages is another problem that leads to feed shortages since feeds are abundant only during the wet and will dry out in the dry season (Phanepaseuth and Inger, 1997). The objective of the research was to determine the dry matter intake, growth rate and appropriate feed combinations of Yankasa Rams fed Pangola grass hay with different supplements in the Semi-arid zone of Nigeria.

MATERIALS AND METHODS

The study was conducted at the Department of Animal Science and Range Management Modibbo Adama University of Technology, Yola in Adamawa State, located in the North Eastern part of Nigeria. Adamawa State is within the Sudan and Guinea Savannah Zones of West Africa and it's characterised by relatively short period of rainy season. Rainy season commences in April and ends in late October while dry season commences in late October and ends in April. The mean annual rainfall ranges between 700mm to 1,600 mm and mean minimum temperature of 390C (Adebayo, 1999).

Experimental Animals

A total number of twelve (12) Yankasa rams that weighed between 18.5 – 20.5 kg and aged between 6- 12 months were used for the study. The rams were given prophylactic treatments, made up of intra-muscular injection of Oxytetracycline (LA: 1ml/10kg body weight). They were dewormed with Banminth FR (12.5g/kg body weight) and bathed with Asuntol R powder solution (3g/litre of water) to remove ectoparasites.

Treatments and Experimental Design

Animals of similar average weights were randomly allocated to 4 treatment combinations of 3 animals/ treatment arranged in a completely randomized design (CRD). The treatments were: T1 (Pangola grass hay only *adlib*), F2 (Pangola grass hay only *adlib* + 300g CSC), T3 (Pangola grass hay only *adlib* + 300g BW) and T4 (Pangola grass hay only *adlib* + 300g MB).

Housing and Management

Each animal was offered 300g of supplement daily in 2 allocations of 150g in the morning at 8:00 am and 150g at 3:00pm in the afternoon. The supplement was fed 30 minutes before the basal feed was given; it was to stimulate the activities of microorganisms so as to act on the basal feed properly. Feed refusals were collected, weighed and recorded. Fresh drinking water was provided in graduated plastic containers. Amount of water consumed by each daily was recorded. Salt lick was provided *adlibitum*. The animals were weighed at the beginning of the experiment and subsequently

at weekly intervals. The difference between the previous and the current weight gave the change in live weight gain. The rams were provided with separate feeding and drinking troughs. Each pen was kept very clean off from faeces and urine.

Digestibility study

The digestibility study commenced after the end of the feeding trial. Four (4) rams were selected and confined in metal metabolism cages to determine the intake and digestibility of nutrients. The cages were designed to facilitate the collection of urine and faeces separately. Wire mesh served as the floor which allowed the animals to stay comfortably. The urine was collected into a funnel which was kept below the cage. The bottle had 10mls of concentrated sulphuric acid which prevented decomposition of nitrogenous compounds in the urine by microorganisms. Feeding and drinking troughs were kept firmly by the sides of the cage. The rams were adapted for 10days and collection period was for 7 days, feed offered and refusals were weighed daily. Total faecal output (10g) and (15mls) of urine were collected daily, weighed and stored in a deep freezer for subsequent chemical analysis. Feed samples collected were oven dried at 700C to constant weight. The chemical composition for crude protein (CP), Ether extract (EE) and Ash were carried out according to AOAC (2004).

Chemical Analysis

The samples used for the formulated diets were analyzed for Dry matter, Crude protein, Crude fibre, Ether extract and Ash according to (A.O.A.C., 2000).

Statistical Analysis

The data collected was analyzed using analysis of variance of a Completely Randomized Design (CRD) and means separated using Duncan's Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

The result of chemical composition of the experimental diets is shown in Table 1. The dry matter (DM) content of Pangola grass hay (93.0%) was higher than (88.96%) reported for Gamba grass by Oloche *et al.* (2015) and CP (7.6%) was higher than the values (6.8%) reported by Nyako *et al.* (2012) for Gamba grass hay, the CF (29.0%) was lower than (33.06%) opined Nyako *et al.* (2012) and the EE (3.0%) was lower than (3.59%), reported by Oloche *et al.* (2015).

Table 1. Chemical composition of experimental diets

Chemical Component (%)	Supplementary Diet			
	Basal Diet Pangola hay.	Maize bran.	Brewers waste.	Cotton seed cake
Dry matter	93.00	91.30	94.30	93.40
Crude protein	7.60	8.30	12.73	36.50
Crude fiber	29.00	10.40	4.30	14.00
Ether extract	3.00	4.00	1.60	23.90
Ash	9.70	3.10	15.60	5.20
NFE	42.80	54.20	39.95	47.90

The DM content of maize bran, brewers waste and cotton seed cake were close to those reported by Tuah *et al.* (1985) and Siulapwa and Simukoko (2001). The 8.30%CP and 36.50%CP

recorded for maize bran and cotton seed cake was in contrast to Malgwi and Mohammed (2015) who recorded 1.30%CP and 38.80%CP for maize bran and cotton seed cake respectively. This is %CP of maize bran in this experiment is however slightly lower than 9.2 %CP reported by Yahaya *et al.* (2001) while that of cotton seed cake (36.5 %CP) was lower than 43.28 %CP reported by Ikurior and Fetuga (1985). The ether extract (EE) percentage of maize bran (4.0%EE) was higher than 1.5%EE reported by Yahaya *et al.* (2001). The ash content of maize bran (3.1%) is slightly higher than 2.4% reported Njei and Reid (1995), the ash content of cotton seed cake (5.2%) tallies with 5.2% reported by Yohanna and Nyako, (2012). The CF content of maize bran (10.4 %CF) was lower compared to 3.0 %CF reported by Yohanna and Nyako, (2012). The crude fiber percentage for brewer's waste (4.30%) was higher than 1.3 %CF revealed Yohanna and Nyako (2012) but cotton seed cake (14.0%) was higher than 11.32% as reported by Siulapwa and Simukoko (2001).

Table 2. Nutrient utilization of Rams fed Pangola grass hay supplements

Indices (%)	T1	T2	T3	T4	SEM
Dry matter intake (g/d)	801.77 ^c	942.7 ^a	807.5 ^c	881.73 ^{ab}	0.75
Water intake (litre/day)	2.5 ^b	2.6 ^b	2.46 ^b	2.36 ^b	0.001
Dry matter digestibility (%)	57.81 ^c	61.8 ^b	60.6 ^c	62.61 ^b	0.22
Crude protein digestibility (%)	63.03 ^b	68.0 ^a	63.0 ^b	66.6 ^{ab}	0.23
Crude fibre digestibility (%)	44.97 ^c	53.7 ^b	52.7 ^b	53.7 ^b	0.19

Means within the same row and with same letters are not significantly different ($p < 0.05$)

T1 = Pangola grasshay only *adlib*
 T2 =Pangola grass hay *adlib*+ CSC
 T3 = Pangola grass hay *adlib* + BW
 T4 = Pangola grass hay *adlib* + MB

From Table 2, the results obtained revealed that different supplements fed to Yankasa rams had significant ($p < 0.05$) effect on dry matter intake. The DMI ranged from 801.77 – 942.7 g/animal/day. The highest DMI was recorded in T2 (942.7 g/animal/day and the least dry matter intake were in T1 (control, 801.77 g/a/d). The presence of cotton seed cake as a supplement in treatment T2 could have influenced intake. Yahaya *et al.* (1999), had reported positive effect of cotton seed cake on intake in the diet of ruminants. The effect of supplementation on DMI was also previously reported by Nyako *et al.* (2012) where a total DMI showed a significant increase ($p < 0.05$) with increasing levels of cowpea vines supplementation when Gamba grass hay was fed as basal diet. The research findings of Ajiji *et al.* (2013) supported the fact that supplementation significantly ($p < 0.05$) improved DMI when Gamba grass hay was fed as basal diet supplemented with acacia pods. The daily water intake ranging from 2.36 – 2.6 litres/animal/day with animals fed Pangola grass hay + cotton seed cake having the highest intake and animals fed Pangola grass hay only (2.36 g/animal/day) had the lowest water intake. There was an increase in daily water intake recorded in those rams that were supplemented than control (unsupplemented). The range of values recorded in this study (2.36 – 2.6 l/a/d) was within 2.0 3.0 l/a/d reported by ARC (1984) for water intake of rams under varying environmental conditions. Previous reports by Ajiji *et al.* (2013) revealed an increased of water intake ranging from 2.40 to 2.46

litres/animal/day when Yankasa rams were fed a basal diet of Gamba grass supplemented with acacia pods. All the rams performed better in terms of water intake as compared to control showing that the supplements increased DMI and ultimately more water was consumed. The values for the DMD presented varied from 57.81 - 62.61% with T4 (62.6%) recorded the highest digestibility and the least was in the control (57.8%). The CPD ranged from 63.03 - 68.00% with T2 (68.00%) having the highest digestibility and T1 (63.03%) had the least value. Similarly, CFD varied from 44.97% in T1 to 53.70% in T2. A significant digestibility was recorded in the three treatments (T2, T3 and T4) as a result of supplementation which tallies with previous reports by Nyako *et al.*, (2012) that supplementation resulted in improved digestibility of the diets. The increased dry matter intake and growth rate of rams suggested that supplementation improved the nutritive value of grass and crop residues. This could be accounted for by the higher CP content and digestibility of supplemented diets compared to control diets.

Table 3. Growth performance of Yankasa Rams fed Pangola grass hay with different supplements

Indices (%)	T1	T2	T3	T4	SEM
Initial weight (kg)	21.50 ^c	21.50 ^a	21.60 ^a	21.51 ^a	0.005
Final weight (kg)	23.30 ^b	25.80 ^a	24.20 ^b	24.80 ^b	0.01
Mean weight gain (kg)	1.80 ^d	3.70 ^c	2.70 ^c	3.20 ^b	0.31
Daily weight gain (g)	32.10 ^d	66.10 ^b	48.20 ^{bc}	57.10 ^c	0.40

Means within the same row and with the same letters are not significantly different ($p > 0.05$)

T1 = Pangola grass hay *adlib* only
 T2 = Pangola grass hay *adlib*+ CSC
 T3 = Pangola grass hay *adlib* + BW
 T4 = Pangola grass hay *adlib* + MB

The daily live weight gain of rams fed treatment diets is summarized in Table 3. The mean live weight gain ranged from 32.21 to 66.1 g/animal/day and this was significantly different ($p < 0.05$). The daily live weight gain was very high for rams fed Pangola grass hay supplemented with cotton seed cake. An increase in the weight of the rams indicated that nutrients in the diets were adequate for growth performance. The results of this experiment are in line with the report of Siulapwa and Simakoko, (2001) who opined that nitrogen source supplements increased growth rate. Treatment T2 had the highest daily live weight gain, showing that CSC with high dietary nitrogen (CP) served as the best supplement, in this research. This observation was similar to the opinion of Fajemisin *et al.* (2015) that CSC attributed to the quality of the diets, nutrients intake and digestibility that lead to increase in daily live weight gain.

Conclusion

Pangola grass hay being one of the basal feeds for feeding small ruminants is very much available in the zone. Rams that were supplemented had higher DMI, DMD CPD, CFD, water intake and higher live weight gain as against those rams that were not supplemented (control).

Recommendation

It is therefore recommended to supplement Pangola grass hay with cotton seed cake in the Semi-arid zone of North East of

Nigeria because it gave the highest dry matter intake and weight gain as compared to other supplements.

REFERENCES

- Adebayo, A. A. 1999. Climate I, sunshine, temperature, evaporation and relative humidity. Adamawa State in Maps, Paraclete publishers pp. 20 – 22
- Ajiji, I. Nyako, H. D. and Asom, S. A. 2013. Performance of Yankasa Rams Fed *Andropogongayanus* (Gamba grass) Hay Supplemented with *Faidherbiaalbida* (Acacia) Pods. Journal of Biology, Agriculture and Healthcare. www.iiste.org.
- AOAC, (2000). Official Methods of Analysis, 17th ed. Association of Official Analytical Chemists. Washington, DC.
- AOAC 2004. Association of Official Analytical Chemists, 20th Edition Washington D.C.
- ARC 1984. Agricultural Research Council, The Nutrient Requirements of Ruminants Livestock, Supplement No 1: Common Wealth Agricultural Bureau, Farnham Royal, UK P. 45.
- Duncan, D. B. 1955. Multiple Range and Multiple F-tests Biometrics, 11: 1-42.
- Fajemisin, A. N. Chineke, C.M. Fadiyimu A.A. and Fajemisin, A. J. 2015. Response of West African Dwarf Sheepto differently processed corncob meal based diets. *Nigerian Journal of Animal Production* 42 (1):162-170
- Ikurior, S. A. and Fetuga, B. L. A. 1985. The replacement value of Nigeria cotton seed meal for groundnut cake in diets for weaner growing pigs. *Nigeria Journal of Animal Production*.12:(1)13-28.
- Kiangi. E. M. I. Katagile, J. A. and Sundstol, F. 1981. Different sources of ammonia for improving the nutritive value of low quality forages. *Animal Feed Science and Technology*. 6:377-386.
- Lakpini, C. A. M. 2002. Feeds and feeding strategies for small ruminants in various physiological states. A paper presented at the small ruminants production training workshop held at National Animal Production Research Institute (NAPRI), ABU Zaria 13th-18th January, 2002, Pp40-47.
- Malgwi, I.H., and I.D. Mohammed. 2015. Development of Dry Season Supplements for Ruminants and Their Degradation Characteristics in the Semi Arid of Nigeria. *Global Journal of Animal Scientific Research*. 3(2): 403-411.
- Mohammed, S.S. Muhammad, I. R. and Baba, M. 2015. Evaluation of Forage Resources of the Zange Grazing Reserve. *Proc.40th Ann. Conf. Nigerian Society for Animal Production, 15-19th March,, 2015, NAPRI/ABU, Zaria*, Pp 472-475.
- Njei, M. and Reid, J.D. 1995. Potentials of crop residues and agricultural by-products for feeding sheep in a Gambian Village. *Animal Feeds Science and Technology*. 52: 213-223.
- Nyako, H. D. Joseph, R. A. Ibrahim, B. G. and Gworgwor, Z. A. 2012. Effects of supplementary feeding of cowpea vines on performance of Yankasa Rams offered a basal diet of Gamba grass. *J. Arid. Agric.* Vol. 21, 2012, 6-11.
- Nyako, H. D. Joseph, R. A. Ibrahim, B. G. and Gworgwor, Z. A. 2012. Effect of Cowpea husk supplementation on the performance of Yankasa rams fed *Gmelina (Gmelinaaborea)* leaves. *J. Arid. Agric.* Vol21, 2012, 12-16.
- Oloche, J. Oluremi, O. I. A. and Shaapera, S.S. 2015. Performance of West African Dwarf (WAD) Goats Fed Gamba grass (*Andropogongayanus*) Supplemented with diet containing treated and untreated sweet orange (*Citrus sinensis*) peels. *Proc.40th Ann. Conf. Nigerian Society for Animal Production, 15-19th March,, 2015, NAPRI/ABU, Zaria*, Pp 488-490.
- Phonpaseuth. P. And Ignier, L. 1997. Environmental Adaptation of Forage in LAO.PDR. livestock Development Division, DLF, Ministry of Agriculture and Forestry, LAO, PDR.
- Siulapwa, N. J. and Simukoko, H. 2001. Status of crop residues and agro-industrial by-products as supplementary animal feeds in Zambia – A review. School of Veterinary Medicine Department of Biomedical Sciences. University of Zambia P.O. Box 32379. Lusaka, Zambia.
- Tuah, A. K. Dzoagbe, S. and Adomako, D. 1985. Evaluation of cocoa pod husk as feed ingredient for sheep in Ghana. Proceedings of the 9th International cocoa conference, 12th - 18th Feb.1985, Lome, Togo. Pp 505-510.
- Yahaya, M.S. Aliyara, Y. H. Ardo M. B. Nyako, H. Ibrahim C. J. Takahashi and Matsuoka, S. 2001. Growth performance and cost effectiveness of rams fed groundnut and cowpea hays supplemented with equal quantity of maize offal in North Eastern Nigeria. *Malaysian Journal of Animal Science* Vol. 7(1) 2001.
- Yahaya, M.S. Takahashia, J. and S. Matsuoka, S. and Kibon, A. 1999. Effect of supplementary feeding of cottonseed cake on feed intake, water consumption and work output of work bulls in Borno State, Nigeria. M.Sc. thesis Department of Animal Science, University of Maiduguri, Nigeria.
- Yohanna, D. and Halilu, H. D. 2012. Effects of feeding Cowpea husk Supplemented with Agro-industrial By-products on Yankasa Rams. *Proc.17th Conf. Anim. Sci. Association of Nigeria 9-13, 2012, Abuja*, Pp 630-633.
- Zemmenlink, G. 1999 Utilization of poor quality roughages in Northern Guinea Savanna Zone. A paper presented at the proceeding of the International symposium on Animal production in the topics held at University of Ibadan 26th – 29th March 1973. Edited by J.K. Loosli, V.A. Oyenuga and G.M. Babatunde (1999), Printed by Heinaman Educational Book Nigeria PLc. Ibadan Nigeria, Pp.167-170.
