

Nutrient Intake and Digestibility of West African Dwarf Rams Fed Toasted *Enterolobium cyclocarpum* based Multi-Nutrient Feed Blocks

Adekunle Akinlolu, (Ph.D. in view)*; Oluwasanmi Arigbede, Ph.D.; Dele Peter, Ph.D.; Ayotunde Ogunsakin, (Ph.D. in view); Olumuyiwa Ogunbote, (M.Agric. in view); and Micheal Kolade (M.Agric. in view)

Department of Pasture and Range Management, Federal University of Agriculture, Abeokuta, Ogun State, Nigeria.

E-mail: akinloluadekunle@gmail.com*

ABSTRACT

The nutrient intake and digestibility of toasted *Enterolobium cyclocarpum* multi-nutrient based feed blocks was conducted in an experiment with West African Dwarf rams. The nutrient intake (dry matter, crude protein, organic matter, ether extract, and ash) all in gd^{-1} and digestibility (dry matter, crude protein, organic matter, ether extract, and ash) all in % was determined.

The study lasted for 16 weeks during which feed intake and digestibility were monitored in 25 West African Dwarf rams using a completely randomized design. Five feed blocks (FB) were produced containing toasted *Enterolobium cyclocarpum* seed meal (TECSM) and *E. cyclocarpum* foliage meal (ECFM), respectively, at the ratio of 0:0% (Control: FB1), 0:30% (FB2), 10:20% (FB3), 20:10% (FB4), and 30:0% (FB5) inclusion levels. FB2, FB3, FB4 and FB5 had higher dry matter and crude protein intake (1062.66 , 1099.64 , 799.66 and 907.41gd^{-1}) and (78.14 , 120.96 , 74.62 , and 92.72gd^{-1}), respectively, compared to FB1 (711.36gd^{-1}) and (44.68gd^{-1}), respectively. There was an increase in the nutrient intake and digestibility as the ECFM increases and declined at FB4. The highest dry matter, organic matter, ether extract and ash digestibility of 87.24 %, 87.24 %, 77.28, and 88.98 % was recorded for 30% TECSM + 0% ECFM (FB 5) at the end of the study. To this effect, ruminant animals could be fed feed blocks (FB) containing toasted *Enterolobium cyclocarpum* seed meal (TECSM) and *E. cyclocarpum* foliage meal (ECFM) up to 30% inclusion level.

(Keywords: toasted *Enterolobium cyclocarpum* seed meal, TECSM, *E. cyclocarpum* foliage meal, ECFM, feed block)

INTRODUCTION

The seasonal availability of livestock feed resources with good nutritive quality and quantity during the dry season in Nigeria has hampered sheep and goat production resulting in weight losses, low birth weights, lowered immunity, and high mortality (Fajemisin *et al.*, 2010). The high cost of conventional feed coupled with decline in natural pasture nutritive quality during the dry season of the year that causes major low productivity of livestock could not be avoided, and alternative feed resources must be provided (Akinfala and Tewe, 2002; Aye, 2007).

Recent studies on *Enterolobium cyclocarpum* revealed high amount of nutrients with low anti-nutritional factor that can enhance livestock productivity in Nigeria (Akinlolu *et al.*, 2018, Arigbede *et al.*, 2008). Forage based feed-blocks can be used to preserve excess forages harvested in the raining season for dry season feeding of livestock thereby reducing the communal clashes between pastoralists and crop farmers (FAO, 2007). This study was therefore targeted towards the nutrient intake and digestibility of West African Dwarf rams fed *Enterolobium Cyclocarpum* based multi-nutrient feed blocks.

MATERIALS AND METHODS

Feed intake and nutrients digestibility was carried out at the Small Ruminant Unit of the Directorate of University Farms, Federal University of Agriculture, Abeokuta, Ogun State, Nigeria.

Experimental Materials

The materials used for the feed block production were as stated in Table 1.

Toasting of *Enterolobium cyclocarpum* Seeds

The *Enterolobium cyclocarpum* seeds were toasted in the oven for about 15 minutes at 170°C until the testa started breaking. The foliage was harvested from the same source and air dried for 7 days to 15% moisture content.

Feed Block Production Procedure

The procedure of Asaolu (2012) was used to produce the experimental multi-nutrient feed block.

Experimental Animals and Management

Twenty-five West African Dwarf (WAD) rams aged 10-12 months weighing 10-11 Kg were purchased in the local market within Abeokuta in Ogun state. The animals were housed intensively in well-ventilated individual pens (2 m² floor spaces) in an open-side type of house with corrugated aluminum roofing sheets and wooden slated floor.

The animals were allowed a 14-day adjustment period in the experimental pen, and within this period, they were quarantined. The rams were thereafter allowed an adaptation period of two weeks during which they were given *E. cyclocarpum* based feed block while clean water

was provided *ad libitum*. After the first two weeks of adaption, each ram was fed at *ad libitum* of the allocated feed block for 16 weeks. Feed block offered and left over for each ram were weighed and recorded on daily basis to evaluate feed intake.

Feed Intake and Digestibility

Feed blocks were offered daily in the morning and evening with water provided *ad libitum* during the experimental period. The rams were allowed two weeks for adjustment to the feed blocks before actual data collection commenced. The feed offered and refusals for each ram was weighed and recorded daily.

The digestibility trial was conducted using 15 rams (3 rams per treatment) prior to the end of the 16-week feeding trial. The rams were transferred into individual metabolic cages (1.4 m x 2.0 m) with slated floor equipped with facilities for separate collection of faeces and urine.

Adaptation period of 7 days was followed by 7 days of total faeces and urine collection. Subsamples of daily feed offered, refusals and faeces voided per ram were collected and weighed. At the end of collection period, the faeces collected from each ram over the period were thoroughly mixed, and two subsamples were taken. One of the samples was used for estimating dry matter (DM) by oven-drying at 105°C for 24 hours, while the second sample was oven-dried till a constant weight is attained and milled for chemical analysis. (AOAC, 2000).

Table 1: Composition (%) of Feed Blocks Containing Graded Levels of Toasted *Enterolobium cyclocarpum* (TECSM) Seed and Foliage Meals.

Ingredients	FB 1	FB 2	FB 3	FB 4	FB 5
Cassava peels	39.50	19.50	19.50	19.50	19.50
Groundnut haulms	35.00	25.00	25.00	25.00	25.00
TECSM	0.00	0.00	10.00	20.00	30.00
ECFM	0.00	30.00	20.00	10.00	0.00
Starch	10.00	10.00	10.00	10.00	10.00
Molasses	11.50	11.50	11.50	11.50	11.50
Wood ash	3.00	3.00	3.00	3.00	3.00
Salt	1.00	1.00	1.00	1.00	1.00
Total	100.00	100.00	100.00	100.00	100.00

FB = feed block, TECSM = toasted *Enterolobium cyclocarpum* seed meal, ECFM= *Enterolobium cyclocarpum* foliage meal, FB 1 = 0 % TECSM + 0 % ECFM, FB 2 = 0 % TECSM + 30% ECFM, FB 3 = 10% TECSM + 20% ECFM, FB 4 = 20% TECSM + 10% ECFM, FB 5 = 30% TECSM + 0 % ECFM.

Statistical Analysis

All results obtained were subjected to analysis of variance in a completely randomized design using SAS program general linear model procedure (SAS, 2002). Significant means were compared using the Duncan's Multiple Range Test (Duncan, 1955). A significance level of 5% was used to express statistical difference between means.

RESULTS AND DISCUSSION

The dry matter and crude protein intake of the feed blocks ranges from 711.36 in 0% TECSM + 0% ECFM (FB 1) to 1099.64 gd^{-1} in 10% TECSM + 20% ECFM and 44.68 in 0% TECSM + 0% ECFM (FB 1) to 120.96 gd^{-1} 10% TECSM + 20% ECFM which is slightly higher than the values (787.32 to 801.69 gd^{-1} and 90.86 to 105.66 gd^{-1})

reported by Isah *et al.* (2013) when goats were fed with different tropical browse plants with *Pennisetum purpureum* as basal diet.

There was an increase in the crude protein intake as the dry matter intake increases and this may be attributed to the higher crude protein contents of the feed blocks (Table 2).

The pattern of nutrients intake and digestibility of the feed blocks generally increases as the crude contents increases but specifically FB 3 (10% TECSM + 20% ECFM) in this study had the highest values of nutrient intake.

The nutrients digestibility recorded in this study was significantly different ($P < 0.05$). The digestibility in feed block was highest in 30% TECSM + 0% ECFM and least in 0% TECSM + 0% ECFM.

Table 2: Proximate Composition (%) of Feed Blocks Containing Graded Levels of Toasted *Enterolobium cyclocarpum* (TECSM) Seed and Foliage Meals.

Parameters	FB 1	FB 2	FB 3	FB 4	FB 5
Dry matter	64.50	90.67	83.33	67.67	81.00
Crude protein	12.05	15.58	21.36	18.71	20.28
Ether extract	1.68	1.76	1.72	1.67	1.69
Organic Matter	97.18	96.50	95.04	95.04	95.64
Ash	2.88	3.50	4.96	4.96	4.36

FB 1 = 0% TECSM + 0% ECFM, FB 2 = 0% TECSM + 30% ECFM, FB 3 = 10% TECSM + 20% ECFM, FB 4 = 20% TECSM + 10% ECFM, FB 5 = 30% TECSM + 0% ECFM

Table 3: Nutrients Intake (gd^{-1}) of Feed Blocks Containing Graded Levels of Toasted *Enterolobium cyclocarpum* (TECSM) Seed and Foliage Meals.

Parameters	FB 1	FB 2	FB 3	FB 4	FB 5	SEM
Dry matter intake	711.36d	1062.66a	1099.64a	799.66c	907.41b	3.25
Crude protein intake	44.68d	78.14c	120.96a	74.62c	92.72b	5.33
Organic Matter intake	690.83c	1025.46a	1045.12a	760.10c	867.88b	3.71
Ether extract intake	11.95c	18.75a	18.96a	13.37c	15.28b	0.61
Ash intake	20.53c	37.20a	54.52a	39.56b	39.54b	2.30

^{abcd} : Means with different superscripts along the row are significant ($P < 0.05$), FB feed block, FB 1-FB 5 –See table 1 footnote, SEM = Standard errors of mean.

Table 4: Nutrients Digestibility (%) of Feed Blocks Containing Graded Levels of Toasted *Enterolobium cyclocarpum* (TECSM) Seed and Foliage Meals.

Parameters	FB 1	FB 2	FB 3	FB 4	FB 5	SEM
Dry matter digestibility	77.45c	84.34ab	83.79b	77.23c	87.24a	0.95
Crude protein digestibility	84.49	83.04	80.78	78.33	80.54	1.05
Organic matter digestibility	78.72c	85.39ab	84.15b	78.63c	87.24a	0.80
Ether extract digestibility	52.85c	64.47b	76.42a	59.02bc	77.28a	2.22
Ash digestibility	59.58c	73.64b	87.17a	72.63b	88.98a	2.37

^{abcd} : Means with different superscripts along the same row are significant ($P < 0.05$), FB feed block, FB 1-FB 5 –See table 1 footnote, SEM = Standard errors of mean.

CONCLUSION

In conclusion, the results of this study show that high crude protein intake and digestibility in all the feed blocks indicates that the feed block have the potential of being used for feeding ruminants during the dry season. Though 30% TECSM + 0% ECFM (FB5) gave the highest positive in terms of dry matter digestibility, crude protein digestibility, organic matter digestibility. it could also be worthy of investigation for on-farm experiment and adoption in other to reduce communal clashes between the pastoralist and crop farmers.

REFERENCES

1. AOAC. 2000. *Association of Official Analytical Chemists: Official Methods of Analysis. 6th Edition*. AOAC: Washington, D.C.
2. Akinfala, E.O. and O.O. Tewe. 2002. "Utilization of Varying Levels of Palm Kernel Cake and Cassava Peels by Growing Pig". *Tropical Animal Production Investment*. 5:87 – 93.
3. Akinlolu, A., O. Arigbede, P. Dele, and A., Ogunsakin. 2018. "Proximate and *In Vitro* Gas Production of Toasted *Enterolobium cyclocarpum* based Multi-Nutrient Feed Block". *Pacific Journal of Science and Technology*. 19(1):257-263.
4. Arigbede, O.M., U. Anele, A.O. Jolaosho, J.A. Olanite, J.S. Onifade, and T.A. Waheb. 2008. "Chemical Composition and *in vitro* Gas Production of African Dread Fruit (*Treculia africana*) var. Decne". *Achivos de Zootecnia* 58(28):113-121.
5. Asaolu, V.O. 2012. "Development of Moringa Multi-Nutrient Blocks as a Dry Season Feed Supplement for Ruminants". *Livestock Research for Rural Development*. 24(3). <http://www.lrrd.org/lrrd24/3/asao24046.htm>
6. Aye, P.A. and M.K. Adegun. 2010. "Digestibility and Growth in West African Dwarf Sheep Fed *Gliricidia* – Based Multinutrient Block Supplements". *Agriculture and Biology Journal of North America*. 1(6):1133-1139.
7. Aye, P.A. 2007. "Production of Multinutrient Blocks for Ruminants and Alcohol from the Waste Products of *Leucaen leucocephala* and *Gliricidia sepium* Leaves using Local Technologies". Ph.D. Thesis. Federal University of Technology: Akure, Nigeria.
8. Duncan, D.B. 1955. "Multiple Range and Multiple F-tests". *Biomedical*. 11:1-42.
9. Fajemisin, A.N., A.A. Fadiyimu, and J.A. Alokun. 2010. "Nutrients Digestibility and Performance of West African Dwarf Sheep Fed Dietary Inclusion of Sundried or Fermented Rumen Digesta and Poultry Droppings". *Journal of Sustainable Technology*. 1(1):76- 84.
10. Food and Agriculture Organization of United Nations Rome. 2007.
11. Isah, O.A., S.A. Oguntuyo, R.O. Dawodu, O.O. Diya, M.O. Afolabi, and L.A. Omoniyi. 2013. "Feed Utilization, Rumen Parameters, and Microbial Profile of Goats fed Different Tropical Browse Plants with *Pennisetum purpureum* as Basal Diet". *Pacific Journal of Science and Technology*. 14(1):397-405.
12. Oladotun, O.A., A.B.J. Aina, and E.B. Oguntona. 2003. "Evaluation of Formulated Agro Industrial Wastes as Dry Season Feed for Sheep". *Nigerian Journal of Animal Production*. 30(1):71–80.
13. Osakwe, I.I. and R.N. Udeogu. 2007. "Feed Intake and Nutrient Digestibility of West African Dwarf (WAD) Goat Fed *Pennisetum purpureum* Supplemented with *Gmelina arborea*". *Animal Research International*. 4(3):724 – 727.
14. SAS®. 2002. *User's guide: Statistics, Version 9.1*. SAS Institute, Inc.: Cary, NC.

ABOUT THE AUTHORS

Adekunle Akinlolu, is a Ph.D. student of the Department of Pasture and Range Management, Federal University of Agriculture, Abeokuta, Nigeria. He is currently working as an extension advisor in Ogun State Agricultural Development Program under Ogun State Ministry of Agriculture.

Dr. Peter Dele, is a registered Animal Scientist and is a member of the Nigerian Institute of Animal Science. He is a Lecturer in the Department of Pasture and Range Management, Federal University of Agriculture, Abeokuta, Nigeria. He holds a Ph.D. in Pasture Production and Utilization and with keen interest in forage conservation.

Dr. Oluwasanmi Arigbede is a Professor in the Department of Pasture and Range Management, Federal University of Agriculture, Abeokuta, Nigeria. He specializes in forage science and animal nutrition.

Ayotunde Ogunsakin, is a Ph.D. student of the Department of Pasture and Range Management, Federal University of Agriculture, Abeokuta, Nigeria.

Olumuyiwa Babajide, is a Masters student of the Department of Pasture and Range Management, Federal University of Agriculture, Abeokuta, Nigeria.

SUGGESTED CITATION

Akinlolu, A., O. Arigbede, D. Peter, A. Ogunsakin, O. Ogunbote, and M. Kolade. 2018. "Nutrient Intake and Digestibility of West African Dwarf Rams Fed Toasted *Enterolobium cyclocarpum* based Multi-Nutrient Feed Blocks". *Pacific Journal of Science and Technology*. 19(2):314-318.

 [Pacific Journal of Science and Technology](http://www.akamaiuniversity.us/PJST.htm)