NITROGEN INTAKE AND NITROGEN RETENTION IN WEANER RABBIT FED DIFFERENT PLANT PROTEIN SOURCES

[1]Munza, B. M., [1]Modu, A., [2]Zagi, S. P. and [1]Adamu, J.
[1]Department of Animal Science, University of Maiduguri, Borno State,
[2]Aminu Saleh College of Education, Azare, Bauchi State.
Corresponding Author: bellomunza@gmail.com, 07038737250

ABSTRACT
The study was conducted to determine the nitrogen retention in rabbits fed different plant protein source in the livestock teaching and research farm university of Maiduguri from May - August, 2023. The experimental diets T1 (Groundnut cake), T2 (Moringa leaves), T3 (Cowpea husk) and T4 (Groundnut haulm). Twenty (20) rabbits having an average weight of 847.20g were randomly assigned to the four dietary treatments (i.e five rabbits per treatment as replicate) in a complete randomized design, 100g of feed was given on a daily basis and water is ad-libitum. The result of nitrogen retention indicate that rabbits fed T1 (groundnut cake) has the highest nitrogen retention percentage followed by rabbits in T2 (Moringa leaves), T3 (Cowpea husk) and T4 (Groundnut haulm). Therefore, groundnut cake, moringa leaves, cowpea husk and groundnut haulm are acceptable to rabbits when included in their diets.
Keywords: Nitrogen Intake, Plant Protein and Rabbit

INTRODUCTION

Rabbits are pseudo-ruminants with the ability to convert roughages with high levels of fibre content to meat efficiently without alteration in the quality of meat produced (Iyeghe-Erakpotobor and Adeyegun, 2012). This could help in reducing the cost of feed for rabbits, since man does not utilize roughages as food. Hence competition between humans and rabbits can be greatly minimized if roughages are incorporated into rabbit feeds to supply fibre and also energy, protein, minerals and vitamins, especially from forages of legume species. Rabbits in the wild naturally feed on high fibre diets; this is a different scenario from intensive rabbit production. In the wild, there is a wide range of choices to make depending on availability and preference.

Nitrogen retention refers to the amount of nitrogen that is absorbed and retained by the body for growth and maintenance purposes, as opposed to the amount that is excreted in the urine and feces. Legumes are an important source of protein for rabbits, particularly during the weaning phase when they are transitioning to solid foods. Nitrogen retention is an important measure of the efficiency of dietary protein utilization by rabbits (Hassan *et al*., 2016).

The rabbit's digestive system is well adapted to herbivorous way of living (Aduku and Olukosi, 1990). The special adaptive features of rabbits include the nature of their teeth, bile production, voluminous intestine which has enlarged caecum ending in a vermiform appendix. These features make it possible for rabbits to handle forages successfully. Aderinola *et al*. (2008) included varying levels of *Centrosema pubescens* and *Calopogonium mucunoides* forage meals in concentrate diet of rabbits and obtained good performance. Iyeghe-Erakpotobor (2006) included forages up to 50% of concentrate in a feeding trial and obtained weight gains with rabbits. Considering the advantages of using legume forages such as groundnut haulms, moringa and cowpea husk to feed rabbits, this study was conducted to investigate the nitrogen intake and nitrogen retention in weaner rabbit fed different plant protein sources.

MATERIALS AND METHOD

***Experimental site*:** The experiment was conducted at the Slaughter House of the Livestock Teaching and Research Farm of the Department of Animal Science, University of Maiduguri.

***Source of experimental materials and experimental diets*:** Feed ingredients were purchase from an open market within Maiduguri while rabbits were obtained from small holder rabbit farmer within Maiduguri Metropolitan Council. Maize, Maize offal, fish meal, plant protein source (groundnut cake, *Moringa* leaves, cowpea husk and groundnut haulm), lime stone, bone meal, vitamin premix, lysine and methionine where use to formulate a 13% crude protein diet. The plant protein source was use as

treatment in which groundnut cake as treatment 1 (T1), *Moringa* leaves as treatment 2 (T2)**,** Cowpea husk as treatment 3 (T3) and groundnut haulm as treatment 4 (T4). The experimental diet contains 12-13% crude protein.

***Management of experimental animals*:** Twenty (20) growing rabbits of mixed breed and sex was randomly assign to four dietary treatments (groundnut cake, moringa, cowpea husk, groundnut haulms) with five animals per treatment each standing as a replicate. The Rabbit was stay for 1 week acclimatization period; the rabbit was house in individual cage measuring 15cm×7cm (width ×length height) the cages was provided with a feeder and drinker in each cage. The feeders, drinkers, and pen were clean daily.

***Nitrogen retention studies*:** At the end of the growth study, three (3) rabbits from each of the treatment groups was randomly selected and housed in individual metabolism crates ideal for easy collection of urine and faeces as described by Osuji *et al*. (1993)**.** The rabbits were maintained on the same treatment diets in the feeding trial. The animals were allowed 7 days' adjustment period to the feed and crates while 7 days was use as collection period for urine and faeces. The orts of previous day's feed was collected and weighed each morning at 8:00 am. The total faecal output from individual animals was collected daily in the morning, weighed, mixed thoroughly and 10% sub sample was taken for dry matter determination. The total faecal sample was collected over the 7 days' period, bulked and sub sampled for laboratory analysis after treating with 20% formaldehyde to prevent further bacterial activity. The total urine output for 24 hours was collected from individual animal for a period of 7 days. This will be done using graduated plastic containers containing 10ml of 0.1M H_2SO_4 which was placed under the metabolism crates. An aliquot (10%) of the daily urine output was taken from each rabbit, bulked and stored in a freezer at (0^oC) until required for analyses as described by Osuji *et al*. (1993).

***Chemical analysis*:** The milled samples of the experimental diets, fresh rabbit meat were taken to the Department of Animal Science laboratory, University of Maiduguri for proximate analysis. These samples were determining according to the procedure of Association of Official Analytical Chemist (AOAC, 2005). The following parameters were determined dry matter (%DM), crude protein (%CP), crude fibre (%CF), ether extract (%EE), Ash and Nitrogen free extractive (% NFE). % NFE was calculated as; % NFE = 100 - (% CP + % CF + % EE + % Ash).

Data analysis: The data collected were subjected to analysis of variance (ANOVA), using the General Linear Model Procedure of SAS (2005). The significant differences among the treatment means was separated using the Duncan`s Multiple Range Test (Duncan, 1955) in the SAS Package.

RESULTS AND DISCUSSION

***Proximate composition of experimental diets*:** Higher dry matter (DM) content was recorded in groundnut cake diet while lower value was observed in groundnut haulm diet which implies that the diets can be stored for longer period of time without spoilage. The crude protein increases across the dietary treatment. Higher crude protein (CP) content was recorded in groundnut cake diet, followed by *Moringa oleifera* diet while a lower value was observed in cowpea husk diet. This is attributed to higher crude protein content of groundnut cake and *Moringa oleifera* which concur with the report of (Anwar *et al.,* 2007; Abbas and Ahmed, 2012; Yaméog *et al.,* 2011). Higher crude fibre content was observed in groundnut haulm diet followed by cowpea husk diet while lower crude fibre content was observed in groundnut cake diet which can be attributed to variation in planting location, processing method, maturity, and weather condition.

Table 1: Proximate composition of experimental diets

Parameter (%)	Groundnut cake	Moringa leaves	Cowpea husk	Groundnut Haulms
Dry matter	93.10	91.92	92.73	91.06
Crude protein	13.99	13.55	12.13	12.72
Ether extract	1.94	2.80	2.08	1.84
Crude fibre	10.36	10.69	14.86	15.32
Nitrogen free extract	47.78	14.85	42.34	51.57

***Nutrient intake of rabbits fed diets containing different plant protein sources*:**

There is significance (P<0.05) difference among the parameters observed for nutrient intake (Table 2). The dry matter, crude protein, crude fibre and nitrogen free extract intake increased across the dietary treatment. This study agrees with the findings of (Nuhu, 2010) who reported increase in intake of rabbits fed graded levels of *Moringa* leaves. Dry matter, crude protein, crude fibre and nitrogen free extract intakes were higher (P<0.05) for groundnut haulms, followed by cowpea husk while lower inatkes were obtained for groundnut cake. This could be due to decrease caloric density of the diet with corresponding increase in dietary fibre, this is in consonance with earlier report that high fibre diet tends to increase feed intake in rabbits (de Blas, *et al.,* 1995; Jokthan, *et al.,* 2006). Rabbit like most monogastric animal voluntarily adjust their feed intake to meet their energy requirement (NRC, 1994). Ether extract intake was higher (P<0.05) for *Moringa* leaves, followed by cowpea husk while lower intake was recorded for groundnut cake.

Table 2: Nutrient intake of rabbits fed diets containing different plant protein sources

Parameters (%)	Groundnut cake	Moringa leaves	Cowpea husk	Groundnut haulms	SEM
Dry matter	46.23^{c}	50.67^{b}	62.93^{a}	65.74^{a}	1.96
Crude protein	6.94^{c}	7.46^{c}	8.23^{b}	9.18^{a}	0.28
Ether extract	0.96^{d}	1.54^{a}	1.41^{b}	1.32^{c}	0.04
Crude fibre	5.14^{d}	5.89^{c}	10.08^{b}	11.05^{a}	0.29
Nitrogen free extract	23.73^{c}	22.21^{c}	28.73^{b}	37.23^{a}	1.00

^{abcd}Means with different superscript within rows differed significantly (P<0.05), SEM = Standard error mean

***Nitrogen retention in rabbits fed diets containing different plant protein sources*:** The nitrogen retention in rabbits fed diets containing different plant protein sources is presented in Table 3. There was significant (P<0.05) effect of dietary treatment on the nitrogen retention parameters of rabbit. The nitrogen retention values recorded are nitrogen intake (1.01– 1.35g), feacal nitrogen loss (0.11– 0.24g), urinary nitrogen loss (0.07– 0.18g), total nitrogen loss (0.19– 0.40g), nitrogen retained (0.82– 0.99g), and nitrogen retained as percentage intake (70.37– 80.98%). The nitrogen intake was observed to be higher (P<0.05) in groundnut haulm diet, followed by cowpea husk diet while lower nitrogen intake was observed in groundnut cake. Higher (P<0.05) total nitrogen loss was recorded in groundnut haulm, followed by cowpea husk diet while lower feacal nitrogen loss was obtained in *Moringa* leaf diet which can be attributed to high nitrogen retention in *Moringa* leave diet (0.99%) and low in groundnut cake (0.82%) which is due to greater nitrogen availability of *Moringa oleifera* was consistent with its crude protein composition making it utilization better than groundnut cake diet. Nitrogen retained as percentage intake was higher in groundnut cake diets, followed by *Moringa* leave diet while lower (P<0.05) nitrogen retained as percentage intake was obtained in groundnut haulms diet which is at par with cowpea husk diet. This might be as a result of the amino acid profile of groundnut cake and *Moringa oleifera*.

Table 3: Nitrogen retention in rabbits fed diets containing different plant protein sources

Parameters	Groundnut cake	Moringa leaves	Cowpea husk	Groundnut haulms	SEM
N intake (g)	1.01^{c}	1.28^{b}	1.29^{ab}	1.35^{a}	0.03*
FeacalNloss (g)	0.12^{c}	0.11^{c}	0.18^{b}	0.24^{a}	0.01*
Urinary N loss (g)	0.07^{b}	0.18^{a}	0.18^{a}	0.16^{a}	0.02*
Total N loss (g)	0.19^{d}	0.29^{c}	0.35^{b}	0.40^{a}	0.02*
N retained (g)	0.82^{b}	0.99^{a}	0.93^{a}	0.95^{a}	0.04*
N retained as % intake	80.98^{a}	77.38^{b}	72.22^{c}	70.37^{c}	1.69*

^{abcd}Means with different superscript within rows differed significantly (P<0.05), SEM = Standard error of mean

CONCLUSION/ Recommendation

It was that the nitrogen retention of rabbit when fed Groundnut cake, *Moringa* leaves, Cowpea husk and Groundnut haulm is not adversely affected by their presence in the diets of rabbit. It was then

recommended that different plant protein sources should be fed to other classes of rabbits such as lactating does.

REFERENCES

Abbas, T.E. and Ahmed, M.E. (2012), "Use of Moringa oleifera seeds in broilers diet and its effects on the performance and carcass characteristics", International Journal of Applied Poultry Research, 1: 1-4.

Anwar, F., Latif, S., Ashraf, M. and Gilani, A.H. (2007). "Moringa oleifera: a food plant with multiple medicinal uses", Phytotherapy Research, 21(1): 17-25.

Association of Official Analytical Chemists A.O.A.C. (2005).Official Method of Analysis.International, Association of Official Analytical Chemists, 24th Edition Washington D.C. USA. Pp. 200-210.

de Blas, J. C., Taboada, E., Mateos, G. G., Nicodemus, N. and Mendez, J. (1995). Effect of substitution of starch for fiber and fat in isoenergetic diets on nutrient digestibility and reproductive performance of rabbits. Journal of Animal Science, 73: 1131-1137.

Duncan, D.B. (1955). Multiple Range and Multiple F-tests. Biometric, 11: 1-42.

Fernandes, L.P., Bezerra, L.R. and Ferreira, M.R. (2019). Use of legumes in rabbit nutrition: A Review. Journal of Animal Physiology and Animal Nutrition. 103(5): 1319-1332. doi:10.1111/jpn.13055

Hassan, M. R., Abdu, S.B., Yakubu, A. S., Yashim, S. M., Adamu, H.Y., Musa, A., Amodu, J. T., Ishiaku, Y. M., Bala, A. G., and Bello, S. S. (2016). Growth performance, nutrient digestibility and nitrogen retention in Rabbits fed graded levels of Velvet bean (Mucuna pruriens L.) forage. Nigerian Journal of Animal Science, (2):346 – 355.

Iyeghe-Erakpotobor, G. T. and Adeyegun, E. S. (2012). Evaluation of growing rabbits fed diets containing varying levels of groundnut forage meal (Arachis hypogea). Journal of Applied Agricultural Research, 4(2): 41 – 51.

Jokthan, G. E., Alawa, J. P., Adeyinka, I. A. and Adamu, A. M. (2006). The effect of fibre sources on the performance of young rabbits. Nigerian Journal of Animal Production, 33: 192 – 196.

National Research Council (1994). Nutrient Requirement for Domestic Animals. Nutrient Requirement of Poultry, 4th edition. National Academic Press. Washington D.C.100-120.

National Research Council (NRC). (1994), "Recommended Dietary Allowances", National Academy Press, Washington DC.

Nuhu, F. (2010). Effect of Moringa leaf meal (MOLM) on nutrient digestibility, growth, carcass and blood indices of weaner rabbits. M.Sc. Faculty of Agriculture and Natural Resources, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana.

Osuji, P. U., Nsahlai, I. V. and Khalili, H. (1993).Feeds Evaluation. ILCA Manual 5: ILCA, Adis Ababa, Ethiopia. Pp. 1-40.

Statistical Analysis Software, (2005). Statistical Analysis Software (CD-ROM), Version 8.1, SAS Institute Inc., Cary, N.C., USA.

Yaméogo, C. W., Marcel Daba Bengaly, M. D. and Savadogo, A. (2011). Determination of chemical composition and nutritional values of Moringa oleifera leaves. Pakistan Journal of Nutrition, 10 (3): 264-268.