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Performance of Growing Rabbits Fed Varied Levels of Zizyphus (*Zizyphus mauritiana*) Leaf Meal Diet in Northern Guinea savannah

Salisu Bakura ABDU*, Mohammed Rabiou HAASAN, Suleiman Makama YASHIM, Hanwa Yusuf ADAMU

ABSTRACT [ENGLISH/ANGLAIS]

Thirty (30) growing rabbits of mixed breeds and sexes with an average initial weight of 526.92 ± 0.25 g were used for this study to determine the effect of level of inclusion of ZLM in concentrate diet on the performance of growing rabbits. The experiment was a completely randomized design involving five treatments which represented five diets with 0, 10, 20, 30 and 40% levels of ZLM inclusion. The experiment lasted for 6 weeks. Significant differences ($p < 0.05$) were observed in weight gains, feed intake and feed: gain ratios. Treatment 2 had the highest weight gain (though not significantly different ($p > 0.05$) from treatment 1) and the best feed /gain values. Nutrient digestibility and nitrogen balance were significantly different ($p < 0.05$) across the dietary treatments. Both parameters showed a decreasing trend with increase in ZLM Inclusion. From the results obtained it was concluded that dried ZLM can be incorporated up to 30% in the diets of growing rabbits without any adverse effect on their performance.

Keywords: Inclusion, Performance, Rabbits, Zizyphus Leaf Meal

RÉSUMÉ [FRANÇAIS/FRENCH]

Trente (30) de plus en plus les lapins de races mixtes et sexes avec un poids moyen initial de $526,92 \pm 0,25$ g ont été utilisés pour cette étude afin de déterminer l'effet du niveau d'inclusion des ZLM dans l'alimentation de se concentrer sur les performances des lapins en croissance. L'expérience a été un dispositif complètement aléatoire impliquant cinq traitements qui représentaient cinq régimes avec 0, 10, 20, 30 et 40% des niveaux d'inclusion ZLM. L'expérience a duré six semaines. Des différences significatives ($p < 0,05$) ont été observées dans les gains de poids, la prise alimentaire et aliments: ratios de gain. Traitement 2 a le gain le plus élevé de poids (mais pas significativement différentes ($p > 0,05$) du traitement 1) et la meilleure alimentation / gain de valeurs. Digestibilité des nutriments et l'équilibre d'azote étaient significativement différentes ($p < 0,05$) dans les traitements diététiques. Ces deux paramètres ont montré une tendance à la baisse avec l'augmentation de l'inclusion ZLM. A partir des résultats obtenus on a conclu que ZLM séchées peuvent être incorporés jusqu'à 30% dans l'alimentation des lapins en croissance, sans aucun effet négatif sur leur performance.

Mots-clés: L'inclusion, la performance, lapins, farine de feuilles Zizyphus

Affiliations:

Department of Animal
Science, Ahmadu Bello
University, Zaria,
NIGERIA

* Email Address for
Correspondence/
Adresse de courriel pour
la correspondance:
sbabdu@gmail.com

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INTRODUCTION

It has been reported that Nigerians are not meeting the daily 75g of protein, of which 34g should be from an animal source required by the WHO [1]. The underlying factors responsible for this include high cost of regular sources of animal protein caused by demand which far outstrips supply [2]. This problem is further compounded by high cost of feed resources which accounts for about 70-80 % of production cost [3].

To solve this problem, attention is being focused on short cycle animals such as the rabbits, grass cutters and other micro livestock. Which have been described as highly prolific animals with a short gestation period and capable of attaining maturity within a very short time [4, 5]. Also, there is the need to adopt an improved strategy that will

involve feeding rabbits with agro industrial by – products and the use of inexpensive, locally available raw materials as noted by M'cenes [6].

Browse plants have been recognized as having the potential to serve as good feed resources, particularly in the dry season because of their year round availability. Simbaya [7] reported that the crude protein content of fodder from shrubs and trees range from 14 to 25% and that supplementation of up to 35% were possible.

Zizyphus mauritiana (Magarya) is a browse plant traditionally used in feeding livestock in arid Nigeria. Morton [8], reported that the leaves are readily eaten by animals and contain 12.5-16.9% CP, 13.9-17.1% CF, 11.5-2, 7% EE, 10.2-11.7% ash and 55.3-56.7%NFE.

However, the presence of anti nutritional factors limits the efficiency of utilization of such foliage in livestock nutrition. At high concentrations there is reduction of animal performance [9]. *Z. mauritiana* has been shown to contain tannin [10]. There is therefore, the need to evaluate the level of inclusion ZLM on performance rabbits.

MATERIALS AND METHODS

Location of the Study

The study was conducted at the rabbitry unit of the Teaching and Research Farm of the Department of Animal Science, Ahmadu Bello University, Samaru, Zaria at 11°11'S and 38°E in the northern guinea savannah zone of Nigeria.

Sources and processing of ZLM

The Zizyphus leaf meal used for this study was harvested from shrubs in the outskirts of Samaru. The pruned branches were sun dried, milled to appropriate size and bagged before incorporation into the experimental diets.

Experimental animals and their management

Thirty (30) growing rabbits of mixed breed and sexes with average initial weight of 526.92 ± 0.25 g obtained from Samaru were used for this study. Prior to the commencement of the experiments, the rabbits were prophylactically treated against internal and external parasites by subcutaneous injection of Ivomec (0.2 ml/rabbit), and a broad-spectrum antibiotic (Oxytetracycline L.A) was also given subcutaneously at the rate of 0.2 ml/rabbit. After balancing for weight, the rabbits were randomly grouped into five (5) dietary treatments with six (6) rabbits per treatment in a completely randomized design.

The rabbits were housed in a three tier cage unit, with each cage measuring 45 cm². Each cage was equipped with plastic drinkers and aluminium feeders. The cages were housed in a room with concrete floor and windows for proper ventilation. Feed and water were supplied *ad libitum*. Proper sanitary condition was maintained throughout the experimental period. The experiment lasted for 8 weeks.

Experimental diets

The percent ingredient composition of the experimental diets is presented in table 1. Five isonitrogenous diets

with 18% CP were formulated to contain ZLM at 0, 10, 20, 30 and 40 % levels of inclusion to replace soya bean meal (SBM). Other ingredients in the diets were maize bran, wheat offal, brewers dried grains (BDG), salt, bone meal and vitamin and mineral premix.

Data collection

The rabbits were fed twice a day at 7:00AM and 4:00PM. Spilled and contaminated feed was recovered, air dried, weighed and subtracted from the amount of feed offered. Feed intake was then determined by difference between feed offered and weigh back. Weight gain was measured weekly. At the end of the experiment average daily feed intake, average daily weight gain, feed to gain ratio and feed cost per Kg weight gain was computed.

Proximate analysis

The dry matter content of ZLM and experimental diets were determined by drying the samples at 60°C for 48 hours, crude fiber (CF) content – by means of Foss Tecator Analyzer, ether extract content – by Soxtec System 1040 and ash content – by combustion at 550°C in Muffle furnace. Kjeldahl nitrogen analyses were performed in duplicate on dried ZLM and experimental diets and CP calculated as $(N \times 6.25)$ according to AOAC [11] procedure.

Statistical analysis

The data obtained from the various studies were subjected to analysis of variance (ANOVA) procedure of SAS [12] in a completely randomized design. Means that were significantly different Duncan Multiple Range Test (DMRT) was used to compare the means

RESULTS AND DISCUSSION

The result of the proximate analysis of the experimental diet is presented in table 2. The CP content of ZLM (17.1) was comparable with the 16.9% reported by Morton [8] and Abdu et al [10] and was within the range of 14- 25% reported by Simbaya [7] for trees and shrub fodder. The CF content was lower than the 13.5-17.1% reported by Morton [8], this may be attributed to stage growth, ratio of stem to leaves. Similarly the ash content was lower than the 10.2 -11.7% range reported by Morton [8] but was however, higher than 6.1% given by Adegbola and Mecha [13] for most West African browse trees and shrubs.

The results of the performance studies are presented in table 3. It showed significant differences ($p < 0.05$) with

respect to final weight, weight gain, average daily feed intake and feed: gain ratio across the dietary treatments. Average daily feed intake showed an increasing trend with increase in the level of ZLM in the diet. Diets 1, 2, and 3 recorded values (66.38, 68.37 and 65.46 respectively) that were statistically similar, but were significantly ($p < 0.05$) different from those of diets 4 and 5 (72.68 and 72.01 respectively), which were similar statistically. This trend was as a result of decreasing energy level that accompanied the increasing ZLM in the diet and is in consonance with the report of Stanford [14] that growing rabbits regulate their feed intake according to energy content. Feed/gain values of treatment 2 was the best, though not significantly different from that of diet 1 but was different from those of diets 3, 4 and 5 which followed in order. The grand mean was comparable with the report of Rahirjo et al [15] who had 4.91 feeding 55g concentrate/sesbania leaf meal and was slightly better than 5.5, 5.8 and 6.7 observed by Abdulmalik et al [16] when he fed growing rabbits with 37.5g concentrates plus Mucuna, lablab and ground nut haulm respectively. The best feed/gain ratio observed in diet 2 may be attributed to a better combination of nutrients in the diet. The significantly poor values as you move from 2 away to 5 could be attributed to the report of Raimondi et al [17] that better feed/gain values are obtained with increasing energy which was the case from diet 5 to 2. Also, due to the significantly reduced nutrient digestibility as we shall see later.

TABLE 3

Table 3 shows the performance of Rabbits fed graded level of ZLM (g)

Parameters (g)	Percent level of ZLM inclusion					SEM
	0	10	20	30	40	
Initial Weight	527.17	526.67	526.67	527.00	526.67	19.47 ^{NS}
Final Weight	1257.70 ^{ab}	1311.80 ^a	1266.80 ^{ab}	1208.20 ^b	1190.00 ^c	33.64
AWG	730.50 ^b	785.17 ^a	739.83 ^b	681.50 ^c	663.33 ^c	25.81
ADWG	14.91 ^b	16.03 ^a	15.10 ^{ab}	13.91 ^c	13.54 ^c	0.53
ADFI	66.38 ^a	68.37 ^a	65.46 ^{ab}	62.68 ^b	62.01 ^b	1.84
Feed to Gain ratio	4.45 ^a	4.26 ^b	4.33 ^b	4.50 ^{ab}	4.57 ^a	0.13
Mortality	0	0	0	0	0	-

^{a, b, c} means with different superscript within the same raw differ significantly ($p < 0.05$) SEM=standard error of means
AWG=Average weight gain, ADWG=Average daily weight gain, ADFI=Average daily feed intake

Diet 2 showed the highest weight gain (785.17) which was comparable with that of diet 4 but significantly better ($p <$

TABLE 1

Table 1 shows percent composition of ingredients in the experimental diet

Ingredients	Percent level of ZLM inclusion				
	0	10	20	30	40
Maize offal	64.11	62.25	53.73	45.21	36.71
SBM	13.32	17.75	12.01	11.27	10.52
ZLM	0	10	20	30	40
BDG	13.32	17.75	12.01	11.27	10.52
Bone meal	1.5	1.5	1.5	1.5	1.5
Salt	0.5	0.5	0.5	0.5	0.5
premix	0.25	0.25	0.25	0.25	0.25
Rice bran	7	-	-	-	-
Total	100	100	100	100	100

TABLE 2

Table 2 shows proximate composition of experimental feed

Parameters	Percent level of ZLM inclusion					ZLM
	0	10	20	30	40	
DM	93.62	95.26	93.49	92.58	92.94	94.44
CP	18.47	18.81	19.21	18.09	18.61	17.46
CF	5.56	7.08	6.48	8.38	8.62	7.89
EE	5.28	4.98	5.06	5.00	5.31	4.99
Ash	8.00	8.23	11.38	10.64	12.24	8.30
NFE	62.68	60.90	57.87	57.89	55.22	61.36

0.05) than the control diet (730.5). This agrees with the report of Dematerova et al [18] that forage/concentrate

was better than forage or concentrate alone. However, from diet 2 down to 5, there was a significant decrease in weight as level of ZLM increases. This trend was similar with the report of Onimisi et al [19] who reported a linear decrease in gain with increasing levels of *Moringa oleifera* leaf meal. The mean daily weight gain (14.7g/day) was comparable with 14.7g/day and 12.7g/day reported by Raharjo et al [15] when 55g concentrate/*Leucaena* and *Sesbania* leaf meals respectively were fed to rabbits. The best feed/gain ratio observed in this study was in diet 2. This may be attributed to a better combination of nutrients in the diet.

CONCLUSION

From the result of this study it can be concluded that inclusion of ZLM in the diet of growing rabbits up to 30% had no detrimental effect on the performance of the rabbits.

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CONFLICT OF INTEREST

No conflict of interest was declared by authors.

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