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Performance of Crossbred Weaner Rabbits Fed Diets Formulated From Mixtures of Legume and Grass

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***Target Audience:** Forage Agronomists, Rabbit Producers, Feed millers*

Abstract

Twenty four (24) crossbred weaner rabbits aged between 5-6 weeks with an initial weight ranging between 587.8g and 658.8g were used to investigate the performance and nutrient digestibility of rabbits fed diets containing mixture of grasses and legume. Three experimental diets were formulated, Diet T_1 was the control fed concentrate feed without forage, Diet T_2 contained a mixture of Gliricidia sepium and Panicum maximum while Diet T_3 contained Gliricidia sepium and Brachiaria brizantha, mainly in substitution for the maize of the control diet. The animals were randomly distributed into three treatment groups of 8 rabbits each with each serving as a replicate in a completely randomised design experiment. The experiment lasted for eight weeks. The type of forage used in this study did not have effect on the nutrient intake of the rabbits and except the dry matter and ash digestibilities, other nutrients were not affected by the dietary treatments. It was observed that final weight, weight gain and daily feed intake are not significantly ($P>0.05$) affected by the experimental diets. The highest final weight (1193g) was observed in T_3 though similar to T_2 (1111.20) and the lowest final weight (1036.20g) was observed in T_1 (containing no forage). Average daily weight gain followed the same trend with 9.54g, 9.35g and 7.6g in recorded for T_3, T_2 and T_1 respectively. The best feed efficiency was observed for T_3 (8.41). It can be concluded that incorporation of legume/ grass mixtures, as substitutes for maize in rabbit diets will give better results when compared with diet without forages.

Key words: *legume/grass mixtures, Concentrate, weaner rabbits, feed efficiency, nutrient digestibility.*

Description of Problem

Animals that survive on forage will be of value now that there is high increase in the price of concentrate diets. This high cost of concentrate diet has resulted into high cost of production mainly in the monogastric sector of animal production. Costs of grains and their by-products used in the concentrate diets have increased dramatically and they are often scarce (1) and are also in competitive demand by man and other livestock animals. This has led to poor economic conditions in many tropical countries and associated increase in the shortage of animal protein. Attention has turned to the production of other farm animals where the cost of production is tolerable, hence rabbit production is fast becoming popular and as a ready solution to the problem of protein shortages. Rabbits have fast growth and short generation interval and are currently gaining recognition in today's market. Rabbit meat is highly digestible, tasty, have low cholesterol

but high protein content (2). The problem for most producers however, is high cost of concentrates feed for the rabbits. Including forage in the diets of rabbits can reduce this problem of high cost of feeding.

Sanni *et al,* (3) evaluated the economics of producing grower rabbits fed different combinations (g/g) of concentrate and *Stylosanthes hamata* and found that 50:75 combinations gave the highest return on investment, thus the cost of feeding grower rabbits could be lowered by supplementing concentrate diet with forages. This has necessitated the need to seek for alternative feed sources in forages. It is especially so because of the greater availability of different forages and ability of rabbits to convert forage into meat for human consumption. The use of forage, agricultural by-products and food processing to substitute concentrate feed may be an alternative means of reducing the high cost of production associated with all concentrate feeding systems.

Linga and Lukefahr (4) advocated raising rabbits on a basic forage diet with an energy supplement in developing countries, where commercial feeds are either not available or cost-prohibitive. Farinu, (5) evaluated the effects of feeding a compound diet based on non-conventional feedstuffs on growth and organ characteristics of the rabbits and confirmed that it was economical to raise rabbits on mixed diet of concentrate and forage. The use of forages in rabbit feeding is normal practice and rabbit producers are advised to feed forages as a supplement to a basic concentrate diet in order to meet the fibre and some of the vitamin requirements. Forages are readily available and cheap in the tropics, and rabbits, being pseudo ruminants have the ability to utilise forages for growth. Although optimum rabbit production could not be sustained on feeding most tropical forages alone, it is possible to reduce the cost of concentrates in the rations by utilising forages that are nutritious and palatable, to achieve a compromise between levels of production and cost that is acceptable to producers. This study, therefore evaluated the utilization of combinations of concentrate, grass (*Panicum maximum and Brachiaria brizantha)* and legume (*Gliricidia sepium)* forages on performance of grower rabbits.

Materials and Method

The experiment was carried out at the Rabbitary Unit of the Teaching and Research Farm Ladoke Akintola University of Technology, Ogbomoso, Oyo State, Nigeria. Ogbomoso is located on Latitude 8^{o} 15 ^{1} North of the Equator and Longitude $4^{o}15$ ^{1} East of the Greenwich Meridan, The region is characterized by a fairly uniform temperature, moderate to heavy seasonal rainfall and high relative humidity. The mean annual rainfall is about 1194mm as presented by (6).

Preparations of forage: The leaves of the grasses (*Bracharia brizantha, Panicum maximum)* and legume, *(Gliricidia sepium)* were harvested from a re-growth (12 weeks) pasture at the Pasture demonstration plot of the University Teaching and Research farm. The forage samples were air dried before grinding at a feed-mill and stored until needed. It was compounded with other feed ingredients bought from a reputable feed-mill. Three experimental diets were formulated (Table 1). Diet T1 (maize based diet) serves as control, diets T2 and T3 consist of combination of grass and legume (*Panicum maximum* and *Gliricidia sepium* in the ratio 9:1, *Brachairia brizantha and Gliricidia sepium in the ratio 29:1 respectively*). Each experimental diet was thoroughly mixed and then processed into pellet. The chemical compositions of the forage were carried out using AOAC method of analysis (7).

Experimental Rabbits and Management: Prior to the arrival of the animals, the rabbit hutches were cleaned and disinfected, feeding

and drinking troughs and collection trays were also cleaned and washed. Twenty four crossbred male rabbits aged between 5-6 weeks old, were used for the experiment. The animals were randomly divided into three treatment groups consisting of eight rabbits per treatment with each rabbit serving as a replicate in a Completely Randomized Design Experiment. There was an adjustment period of two weeks in which they were given vitamins and antibiotics. During the acclimatization period, the animals were fed on control (Diet T_1). The rabbits were intensively managed and housed individually in a cage measuring 45×35×35cm and provided with drinking and feeding facilities made of earthenware pots re-enforced with cement to prevent tipping over. The rabbits were fed at 8.00hr and 16.00hr daily. The initial weight of rabbits were determined and recorded. The rabbit weights and feed consumed were also weighed and recorded weekly. The experiment lasted for 8 weeks. Daily routine management include cleaning of cages, surrounding floor, feeding troughs and drinking troughs. The feeding troughs were emptied of leftover feed and fresh feed served daily. The drinking troughs were also emptied of the previous water, thoroughly rinsed and then filled with cool fresh water. Known quantities of feed were fed to the rabbits twice daily, feed intake was determined by subtracting the weight of the feed refused from the feed offered. Feed intake was calculated for each of the replicate on daily basis. Weight change was determined by finding the difference between initial weights and final weight at the end of the experimental period. Likewise the feed conversion ratio was determined by dividing the average total feed intake by average total weight gain.

Digestibility Trial: At the 8^{th} week of the feeding trial, five animals were randomly selected from each treatment and faecal samples from each was collected daily for 5 days, the faeces were weighed fresh, oven-dried, pooled together and samples taking to determine the proximate composition (7).

Statistical Analysis

All data generated were subjected to statistical analysis using one-way analysis of variance as packaged by (8). Treatment means were compared using the Duncan's multiple range test of the same software.

Results and Discussion

The proximate composition of the experimental diets (Table 1) showed that the crude protein content ranged from 16.89 and 17.15%, and this fall between requirements of grower rabbits as prescribed by (9). The values also falls within the values reported by (10), Adejumo, (11) but lower than those of Biobaku and Dosumu, (12) and Oluponna *et al* ,(13) for growing rabbits. The crude fibre content ranged between 8.29 and 8.65% which falls within the reports of 11 and 14 but is lower than values reported by Biobaku and Dosumu (12).

The performance of rabbits on the experimental diets is shown in Table 3. The final weight, total weight gain and daily feed intake were observed not to be significantly ($P>0.05$) affected by dietary treatments although rabbits on diet T_2 and T_3 reported numerically higher weight gain compared with those on T_1, this may be because rabbit is a pseudoruminant and that they prefer forage to maize based diet. Also the inclusion of *Gliricidia sepium* might have contributed a significant effect because of its high protein percentage as presented in table 2. Lowry *et al*. (15) had earlier observed that rabbits are known not to effectively utilize lignocellulose fibre, but make efficient use of high protein high digestibility forage through their ability to retain fine particles in the caecum and rapidly void less digestible particles. The total and daily feed intake of rabbits on T_2 was highest for the overall experiment while rabbits on T_3

had the least. The feed efficiency was significantly ($P<0.05$) affected with rabbits on diet T_3 having the best feed efficiency followed by those on diets T_2 and T_1. The daily feed intake of rabbits on diets T_1, T_2 and T_3 i.e. 74.31, 77.02, and 65.95g/day respectively were higher than the range of 58.22 - 69.29g/day reported by (16) when rabbits were fed diets containing cassava peels with concentrate. The variation in total feed intake with highest (4313.40g) and the lowest (3693.2g) of animals on T_2 and T_3 respectively agreed with the findings of (17) that when legumes were fed in combination with grasses, intake were quite variable. There was no consistency in intake for any particular legume in mixture with various grasses or for a particular grass in combination with various legumes. Non-significant effect of diet combinations on weight gain of rabbits observed in this study agreed with the report of (17) and (18) who fed varying levels of concentrate and forage to grower rabbits. The lowest weight gain was observed in the control diet containing no forage, which agreed with the work of (19) that rabbits on concentrate diet alone recorded least body weight gain. Absence of forage in rabbit's diet tends to have a depressed effect on its ability to utilize feed and thus on its growth performance because they are pseudo ruminants.

Table 4 shows the nutrient intake of rabbit fed mixture of legume and grass. The intake of crude protein, fat, ash crude fibre and dry matter were not significantly ($P>0.05$) affected with the type of forages used. This shows that type of grass/legume used did not affect the nutrient intake of the rabbits. Similarity in term of nutrients intake is an indication of similar nutrient in the feed supplied, this according to (20) established that the rabbits efficiently utilized the diets in the same manner.

The nutrient digestibility of rabbits fed the mixture of legume and grass is presented in Table 4. Except the dry matter and ash digestibilities, other nutrients were not affected by the dietary treatments. This is an indication that the *Brachiaria brizantha/Gliricidia sepium and Panicum maximum/Gliricidia sepium* mixture were equally digested with respect to crude protein, crude fibre and crude fat. Rabbits on diet 3 (*Brachiaria brizantha* and *Gliricidia sepium* combination) reported the highest ash digestibility value of 82.25% followed by those on Diet1 (control) with a value of 78.75% ash digestibility with the least from rabbits on T_2 *(Panicum maximum* and *Gliricidia sepium).* Similarity in the crude fibre digestibilities may be as a result of similar fibre concentration in the type of grass/legume mixture used. It has been established by (20) that fibres from different sources could vary in the digestibility depending on the proportions of cellulose, hemicellulose and lignin. This study showed that tropical forage grasses and legume used in this research work were consumed in acceptable quantities by rabbits, suggesting that diets based on forage with a concentrate supplement could be used successfully for rabbit production and this will help to reduce the cost of rabbit production since most of all these grass and legumes are readily and freely available.

Conclusion and Application

1. Optimum growth performance of rabbits can be achieved by feeding a *Brachiaria brizantha/Gliricidia sepium and Panicum maximum/Gliricidia sepium* mixtures with concentrate.
2. The incorporation of forages into rabbit diets gives better results when compared with diet without forages.
3. More forages should be examined for the feeding of rabbit**.**

Table 1: Gross Composition of Experimental Diets (%)

Parameters	Diet 1 (control)	Diet 2	Diet 3
Maize	30	-	-
Panimum maximum	-	27	-
Brachairia brizantha	-	-	29
Gliricidia sepium	-	3	1
Fish meal	2	2	2
Wheat offal	20	20	20
Oyster shell	2	2	2
Corn bran	20	20	20
PKC	13	13	13
GNC	10.2	10.2	10.2
Premix	0.4	0.4	0.4
Salt	0.4	0.4	0.4
Bone meal	2	2	2
Total weight (kg)	**100**	**100**	**100**
Proximate Composition of Experimental Diets			
Dry matter (%)	90.76	90.08	90.85
Crude protein (%)	16.89	17.15	16.92
Crude fibre (%)	8.34	8.65	8.29
Ash (%)	7.96	7.87	8.13
Fat (%)	3.81	3.69	3.74

Table 2: Proximate Composition of *Gliricidia sepium, Brachiaria brazantha and Panicum maximum*

Parameter	*Gliricidia sepium*	*Brachiaria brazantha*	*Panicum maximum*
Dry matter (%)	90.37	90.55	90.63
Crude protein (%)	16.67	9.87	10.65
Crude fibre (%)	19.26	29.82	31.27
Ash (%)	13.28	10.83	11.29
Crude fat (%)	5.38	4.69	4.48

Table 3: Performance characteristics of rabbits fed mixture of grass and legume

Parameter	T_1	T_2	T_3	SEM
Initial weight (g)	610.80	587.80	658.80	21.68
Final weight (g)	1036.20	1111.20	1193.00	49.42
Weight gain (g)	425.40	523.40	534.20	47.50
Daily weight gain (g)	7.6	9.35	9.54	0.85
Total feed intake (g)	4161.20	4313.40	3693.2	205.59
Daily feed intake (g)	74.31	77.02	65.95	3.67
Feed Efficiency	11.65^{a}	8.41^{b}	7.9^{c}	1.59

^{abc}- Means long the same row with similar superscript are not significantly (P>0.05) different.

Table 4:Nutrient Intake and Digestibility of Rabbit fed Mixture of Grass and Legume

Parameters (%)	T_1	T_2	T_3	SEM
Nutrient intake				
Dry Matter intake	60.81	65.67	75.22	5.85
Crude protein intake	11.31	12.50	12.77	0.89
Crude fibre intake	5.75	6.30	6.25	1.28
Ash intake	5.39	5.74	6.13	0.42
Crude fat intake	2.55	2.69	2.82	0.20
Nutrient Digestibility				
Dry matter	78.06^{ab}	75.90^{b}	79.99^{a}	0.80
Crude protein	74.44	72.76	76.49	0.91
Crude fibre	6.46	4.17	5.39	1.12
Ash	78.75^{ab}	76.12^{b}	82.25^{a}	1.11
Crude fat	89.55	91.53	87.01	2.02

^{ab}- Means along the same row with similar superscript are not significantly (P>0.05) different.

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