FUDMA Journal of Agriculture and Agricultural Technology
ISSN: 2504-9496
Vol. 7 No. 2, December 2021: Pp.82-89

DOI: https://doi.org/10.33003/jaat.2021.0702.051

EFFECT OF INCLUSION LEVELS OF FICUS (*Ficus sycomorus*) AND AFRICAN LOCUST BEANS (*Parkia biglobosa*) LEAF MEALS DIET ON THE GROWTH PERFORMANCE OF GROWER RABBITS

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ABSTRACT

Sixteen (16) cross bred growing rabbits of both sexes were used for the experiment to investigate, the performance of growing rabbits fed four (4) dietary levels of *Ficus sycomorus* and *Parkia biglobosa* leaf meals (FLM & PLM). The experiment was laid out in a completely randomized design (CRD). The rabbits were randomly selected and allotted into four (4) treatments of four (4) rabbits per treatment. Each treatment had one rabbit as replicates per clutchs. Treatments 1,2,3 and 4 received 0% forage leaf meal, 5% Ficus leaf meal, 5% Parkia leaf meal, and 2.5% Ficus + 2.5% Parkia leaf meals respectively. The results obtained in this study revealed that feed intake of rabbits on diet 4 (85.39g), 1 (83.38g) and 2 (72.19g) were statistically similar (P>0.05) and significantly (P>0.05) higher than those fed diet 3 (66.73g). Rabbits on T1 diet attained the highest daily weight gain (15.18g) compared to rabbits on T4 (15.04), T2 (12.14g) and T3 (11.77g) respectively. Feed cost (₦/Kg), cost/kg gain and daily cost/rabbit (N/d) decreased with inclusion level of forage meal in the diets, while T1 recorded the highest cost in all aspects. Feed conversion ratio was similar (P>0.05) across the treatments.

Key words: *Parkia biglobosa*, *Ficus sycomorus*, Rabbit, Feed intake, Feed conversion.

INTRODUCTION

Feed shortage particularly during dry season limit the animal output in most part of the Nigeria (F.A.O 1990). The available feed resources cannot meet the nutritional requirements of animals throughout the year in many parts of the country either due to inadequate supply or quality of the feed. The feeding of browse forage to the animals, especially in the dry season is essentially. When grass and herbaceous legume forage are scare (Aduku *et al*, 2010) *Ficus sycomorus* and *Parkia biglobosa* tress remains green most of the year and provides protein, vitamins and minerals that are lacking in the dry season to rabbits (Crown and Cheddar, 2012, Telek 2011) and because of their digestive process, they can efficiently utilize these nutrient particularly protein and vitamin B(Aduku *et al*, 2009). It has been estimated that the daily minimum crude protein requirement of an adult in Nigeria varies between 65g and 85g per person; however it is recommended that 35g of this minimum requirement should be obtained from animal products (Olayode, 2015, Britton, 2012). This observed low animal protein consumption may be attributed to the declining animal protein production occasioned by high cost of livestock production especially the cost of feeds which usually account for up to 70% of the total cost of production (Ijaiya *et al.*, 2017). In the present economic condition of the country where there is a great increase in the scarcity of animal protein as well as high cost commercial feed, the forage meal play an important role by being converted into meat and as well as being available almost throughout the year (Aduku *et al.*, 2009, Sherub and tree leaves are an important component of diets for rabbit, sheep goat, cattle, deen and garne. (Papachristou and Nastic, 2011) and play an important role in the nutrition of grazing animals in areas where few or no alternatives are available (Susan, 2009). The leaves of the evergreen trees and shrubs are used as emergency food by sheep and goat in the semi-arad region of the northen Nigeria. (Njidda and Ikhimioya 2010). Some workers (Adegbola and Oduozo, 2009; Alawa and Amadi, 2012) opined that some of the limiting factors associated with using browse plants as animal feeds include procurement, storage. High fiber content, toxic substances, poor feed intake, poor digestibility and consequent law performance of the animals. However, there is need to further investigate the use of these browse plants because of their relative availability as alternative feed resources to livestock. Aduku and Olukosi (2010) reported a range of 2390-2390-2500 Kcal/Kg of energy

and crude protein level of 12-17% for optimum performance of rabbits in the tropics. *Ficus sycomorus* belongs to the family Moraceae which is native to Ethiopia (Orwa *et al.*, 2009). It has been identified as feed for cattle, goat and sheep (Teferi *et al.*, 2008). The leaves are valuable fodder in overstocked semi-arid areas where the trees occur naturally and leaves are much sought fodder with fairly high nutritive values of about 14-17.95% CP and 12MJ/kg net energy on dry matter basis (Devendra, 2012). The African locust bean tree, *Parkia biglobosa* is a perennial tree legume which grows in the savannah region of west Africa up to the southern edge of the Sahel zone 130^0 N (Campbell-Platt, 2012). This tree is not normally cultivated but can be seen in population of two or more in the savannah region of Nigeria (Obioza, 2009). The tree of Parkia species are usually and carefully preserved by the inhabitants of the area where they grow because they are valuable source of reliable food, especially the seeds and the leaves which serves as source of useful ingredients for consumption (Campbell-Platt, 2015). The leaves are much sought fodder with fairly high nutritive values of about 18.40% CP and 18.9% CF on dry matter basis with some significant amount of some minerals Fe, Na, and P (Soetan *et al.*, 2014). it has been reported that the husks and the pods are good feed for live livestock (Susan, 2009). African locust bean has been known to be rich in protein and may thus be used to add protein to a protein deficient diet (Odunfa, 2011; Ikenebomeh and Kok, 2009; Dike and Odunfa, 2011).

The leaves of the plant had higher contents of moisture, crude fiber and ash. The higher fiber content of the leaves suggested that; they would be more effective as agents to control constipation as foods that contain high fiber are known to expand the inside walls of the colon, easing the passage of waste. On the contrary, high fiber diets in the nutrition of infants can lead to irritation of the gut mucosa (Bello *et'al.*, 2008).

MATERIALS AND METHODS

Experimental Site

The study was conducted at the Rabbitry Unit of the Department of Animal Science, Faculty of Agricultural Science and Technology, Kano University of Science and Technology Wudil,. Wudil is a local government area in Kano State, Nigeria. Wudil lies between (latitude 11^0 49N 8^0 51 E/ 11.817^0 N 8.850^0 E) (Olofin, 2010).

Sources of Ingredients

Fresh leaves were collected from Ficus and parkia trees from a farm at Rano local government, dried under shade and in the animal science laboratory using milled using traditional pestle and mortar so as to obtain leaf meal which will later be incorporated into the diet after removing the vines. Maize, Soyabean meal and other ingredients were purchased from market.

Experimental Design and Diet

The rabbits will be randomly divided into 4 treatments with 4 replicates. Feed intake will be determine by difference between feed offered and weigh back. Weight gain will be measured weekly. At the end of the experiment, average daily feed intake, average weight gain, feed to gain ratio and feed cost per kg weight will be computed.

The experimental diets contain the following levels of the forage meals:

1. TI = 0% Forage leaf meal
2. T2 = 5% Ficus leaf meal
3. T3 = 5% Parkia leaf meal
4. T4 = 2.5% Ficus leaf meal + 2.5% Parkia leaf meal

Table.1: Percentage Composition of the Experimental Diets

	Treatments			
Ingredients	T_1 (Control) %	T_2 (5% FLM)%	T_3 (5% PLM)%	T_4 (2.5% FLM+ (2.5% PLM)%
Maize	51.60	47.74	47.88	47.80
SBM	14.90	13.76	13.62	13.71
FLM	0.00	5.00	0.00	2.50
PLM	0.00	0.00	5.00	2.50
Wheat offal	30.00	30.00	30.00	30.00
Bone meal	3.00	3.00	3.00	3.00
Salt	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25
Total	**100**	**100**	**100**	**100**
Calculated Analysis:				
Crude protein (CP)	16.00	16.83	16.90	16.88
Energy (Kcal/Kg)	2692	2532	2543	2533

Premix (grow fast) manufactured by Animal Care Services Consult (Nig.) Ltd. Lagos. Supplying the following per kg of the premix: Vitamin A 32,000,000 IU, Vitamin B3 640,000 IU, Vitamin E 2000 IU, Vitamin K 800mg

Thiamine B1 600mg. riboflavin B2 600mg, Pyridoxine B6 600mg, Vitamin B12 4mg, panthotenic acid 200mg, Folic acid 200mg, Biotin 8mg, Choline 80mg, Antioxidant 50g, Manganese 32g, Zinc 20g, Iron 8g, Copper 2g, Lodine 0.48mg. Selenium 80mg and cobalt 80mg.

SMB = Soyabean Meal

FLM = Ficus Leaf Meal

PLM = Parkia Leaf Meal

Measurement of Productive Parameters

Feed Consumption

Feed consumption from each treatment was measured on daily basis by subtracting the left over from the total feed serviced to each individually caged rabbit and proper measures were taken to ensure safeguard against any form of feed wastage. The mean daily feed intake was computed on weekly basis by dividing the amount of feed consumed by the number of rabbits per treatment.

Daily Weight Gain

An electronic weighing balance was used to determine the body weight of each rabbit and the weighing was conducted every week. Therefore, the mean body weights were computed by taking the average of all the five (5) rabbit after given particular experimental diet (treatment).

$$\text{Daily weight gain (g)} = \frac{\text{Final live weight} - \text{initial live weight}}{\text{Number of rabbits X total days of the trial}}$$

Feed Conversion Ratio (FCR)

This was obtained by dividing the amount of feed consumed by the live weight gain per each treatment group.

$$\text{Feed Conversion Ratio (FCR)} = \frac{\text{Mean feed intake (g)}}{\text{mean body weight gain (g)}}$$

Feed Cost and Proximate Analysis

Feed Cost

Feed costs were computed by calculating the cost of ingredients and forage meal incorporated in the diet, by taking into consideration of the cost of individual ingredient per Kg.

Feed Cost per Kg gain:

This is the ratio of cost in naira of the total feed consumed and the total weight gain in Kg per

Treatment i.e FCR X cost of feed. Feed per Kg gain = Total feed consumed in Kg X Cost

Total weight gain in Kg

Chemical Analysis

Complete of the experimental diets were taken to laboratory for proximate analysis according to procedure of AOAC, (2016).

Statistical Analysis

Data collected were subjected to analysis of variance using general linear model procedure Completely Randomize Design (CRD). Significant means were separated using LSD.

RESULTS AND DISCUSSION

Table 2 below shows the proximate composition of the diets containing different level of forage meals fed to the growing rabbits during the trail and analyzed on dry matter basis. The dry matter, moisture, crude protein, crude fiber, ash and fat ranged from 92.20 to 94.50, 5.50 to 7.80%, 14.25 to 17.01%, 5.18 to 10.71%, 6.04 to 7.23% and 9.98 to 14.32% respectively.

Control diet T1 (0% forage meal) recorded the highest value for dry matter, crude protein and fat but had extremely low value of crude fiber. *Ficus Sycomorus* based diet T2 (5% FLM) had the highest moisture content while *Parkia Biglobosa* based diet T3 (5% PLM) had the highest value of crude fiber and ash but low value in crude portion.

Table 2: Proximate Composition of the Experimental diets

Parameters	T1	T2	T3	T4
Dry matter	94.50	92.20	92.40	93.70
Moisture	5.50	7.80	7.60	6.30
Crude Protein (CP)	17.01	15.98	14.25	16.55
Crude Fiber (CF)	5.18	8.55	10.71	5.98
Ash	6.04	6.45	7.23	6.27
Fat	14.32	10.75	9.98	11.84

Effect of feeding Ficus and Parkia leaf meals on growth performance of growing rabbits

Table 3 shows the effect of feeding various levels of *Ficus sycomorus* and *Parkia biglobosa* leaf meals on the performance of growing rabbits. The result indicate non-significant ($P<0.05$) difference in term of initial weight, final weight, total feed intake and feed conversion ratio while significant ($P<0.05$) difference exist in the remaining parameters observed. Treatment I rabbits (0% forage meal) recorded the highest value (850g), among the treatments in terms of total weight gain and significantly ($P<0.05$) similar with treatment 4 (2.5% ficus + 2.5 Parkia). Daily weight gain values were significantly lower ($P<0.05$) in T3 (11.77g) compared to the rest of the treatment means, while T1 (0% forage meal and T4 (2.5% ficus + 2.5% *Parkia*) recorded the highest values (15.18 and 15.04g) and the values were statistically ($P>0.05$) similar. Daily feed intake follows similar pattern with daily weight gain.

Table 3: Growth Performance of Growing Rabbits fed Ficus and Parkia leaf meals

Parameters	T1	T2	T3	T4	Sig
Initial live body weight (g)	910	940	940	940	NS
Final live body weight (g)	1760	1620	1590	1782	NS
Total weight gain/rabbit (g)	850^{a}	680^{bc}	659^{c}	842^{ab}	*
Daily weight gain (g)	15.18^{a}	12.14^{bc}	11.77^{c}	15.04^{ab}	*
Total feed intake (g)	4669^{a}	4082^{ab}	3737^{b}	4782^{a}	*
Daily feed intake (g/rabbit)	83.38^{a}	72.19^{ab}	66.73^{b}	85.39^{a}	*
Feed conversion ratio	5.51	6.10	5.73	5.85	NS

Sig. = Significance
* = Significant
NS = Not Significant

Cost of Feeding *Ficus* and *Parkia* leaf meals to growing rabbits

The cost of feeding *Ficus sycomorus* and *Parkia biglobosa* leaf meals to grower rabbits is presented in Table 4 Fed cost (N/Kg) decreases steadily as the level of FLM and PLM is increased in the diet. The feed cost per kg in T1 was N130.48 while those of T2, T3 and T4 were (N123.73, N123.48, and N123.62) respectively. The cost per kg gain also declined from N110.91) in T1 to (84.14) in T2 and T3 respectively. However, in T4, the cost per kg gain was a bit lower (N104.10) than T1 but higher but slightly higher than T2 and T3. Thus, the feed cost per rabbit (N/d) follows similar pattern with the cost per Kg gain (N/Kg).

Table 4: Cost of feeding Ficus and Parkia leaf meals to growing rabbits

Parameters	T1	T2	T3	T4
Feed cost (N/Kg)	130.48	123.73	123.48	123.62
Cost/Kg gain (N/Kg)	110.91	84.14	81.34	104.10
Cost of feed/rabbit (N/d)	10.88	8.93	8.24	10.56

Feed Intake

The values (66.73g – 85.39g) obtained for daily feed intake in this study was higher than the values reported by several researchers, Tegbe *et al.;* (2016) who reported the values (49.61-59.89), in rabbits fed different levels of *Ficus* thoning leaves, and values (58-71g) reported by Ajayi *et.al.,* (2017), but lower than the estimates values of (130-134g) reported by Gasim Boubakar *et.al.;* (2017). The higher feed intake values (83.38g and 85.39g) in rabbits on T1 and T4 could be attributed to better palatability of the diet compared to T2 and T3 which resulted in taking less amount of the diet, or might be as a result of a decrease in metabolizable energy as the level of forage leaf meal is increased in the diet as explained by Ajayi *et.al.,* (2017), that generally, animals eat to meet their energy requirement if fed ad libitum.

Weight Gain

The values for the daily weight gain obtained in this study ranges from 11.77 to 15.18g. These values are lower than the values obtained by Lakabi *et al;* (2014) who reported 27.7 to 36.3g daily weight gain for grower rabbits, but slightly higher than the values recorded by Ajayi *et al'*(2017) when Sunflower leaf and blood meal mixture was fed to male weaner rabbit. The higher weight gain of rabbits on T1 and T4 diets might be an indication that the diet was more palatable and get easily digested by the rabbits. These results are in agreement with (Kakengi *et al;*. 2017). The authors attributed this to the similar ability of the rabbits to convert the feed materials into flesh across the dietary treatments. The lower daily weight gain of rabbits on T2 and T3 diet could suggest that the diet may be poorer in palatability than the other diets. This could be as a result of more quantity of anti-nutritional factors present in the diet which might make some of the nutrients unavailable in the diet as stated in the literature.

Feed Conversion Ratio

The feed conversion ratio values (5.51-6.10) obtained in this study were statistically similar among all the treatments which is higher than the values reported by earlier researcher in the tropics (Ayers et al;2016; Okorie, 2013) who found to be within the range of 2.63-4.00. The values obtained were also low compared to what was reported by Jokhtan et al; (2013) when grower rabbits were fed *Ficus thonningii* leaf meal. However, the results are similar to that reported by Abdulmalik et al; (2014) when rabbits were fed mucuna forage. The higher FCR obtained were probably due to the relatively high growth rate and genetic variations among the rabbits and possibly the season in which experiment was carried out.

Feed Cost

Fee Cost N/Kg), cost/Kg gain and daily cost/rabbit N/d) decreases with inclusion level of forage meal in the diet. The control group (0% forage meal) had the highest costs observed among the treatments. This agrees with Abdu et al. (2012) who reported a decrease of the feed cost with the inclusion of unconventional feedstuff. The reduction in feed cost observed from the diets containing the forage meal was due to the relatively little or minimal cost incurred in obtaining the leaves. This means that cheaper feeds can be produced by the inclusion of the forage meals up to 5% without any adverse effect on the growth performance of rabbits.

CONCLUSION

The result of this experiment has shown that *Ficus sycomorus* and *Parkia biglobosa* leaf meals (FLM & PLM) can be incorporated in the diets of growing rabbits and meet the growth performance without any deleterious effects. These forage trees grow widely in this part of the country and the leaves can be easily and cheaply obtained at minimal cost. Therefore, their utilization as rabbits feed will go a long way in solving Nigeria's protein shortage problems.

RECOMMENDATIONS

Based on the results obtained on feed intake and daily weight gain in this study, it can be recommended that *Ficus sycomorus* and *Parkia biglobosa* leaf meals can be incorporated in the diet of growing rabbits at 50:50 percent and provide a positive result. Further studies is however recommended to be carried out in order to evaluate the digestibility of these forage leaf meals on growing rabbits which could be used to assess their effect on the performance of rabbits.

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