PERFORMANCE AND COST BENEFITS ANALYSIS OF WEANER RABBITS FED AFRICAN LOCUST BEAN (*Parkia biglobosa*) LEAF MEAL BASED DIETS

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ABSTRACT
A study was conducted at the Rabbitry unit of the Teaching and Research Animal Farm of the Federal University of Kashere to determine the performance and economics of production of weaner rabbits fed African locust bean (ALB) leaf meal based diets. A total of sixteen (16) weaner rabbits were allocated to four dietary treatments in which ALB leaf meal replaced 'Full-fat' soya bean at 0 (control), 2.5, 5.0 and 7.5% tagged as diets 1, 2, 3 and 4, respectively. The four treatments were replicated four times with one rabbit per replicate in a completely randomized design (CRD). The experiment lasted for five (5) weeks. The results of the proximate analysis of ALB leaf meal showed that, it contains 12.02% crude protein, 3.02% ether extracts, 20% crude fibre, 0.60% Ash and 81.00% carbohydrates. The results of the performance showed that both initial weights (437.50g - 850.00g) and final weights (1012.50g - 1325.00g) were significantly (P<0.05) affected, with diet 4 having the highest value while the lowest was in diet 2, while all other parameters measured were similar. The cost benefits analysis showed that diet 4 had a lower feed cost ₦/kg gain when compared to control with the lowest value. This study, therefore, revealed that African locust bean leaf meal can be utilized up to 7.5% level as partial replacement for 'Full-fat' soya bean as dietary protein source without adverse effects on the performance and with corresponding reduction in feed cost.
Keywords: **African locust bean (ALB) leaf meal, Dietary plant proteins, Feed cost, Performance, Weaner rabbits**

INTRODUCTION

The high costs of feed resources due to shortage and unavailability of conventional feedstuffs for compounding livestock rations has been the major cause of rising cost of animal products and efforts aimed at increasing animal protein supply must necessarily address the competition between man and livestock for feed resources which has often resulted into shortage of such conventional feedstuffs like maize, soya beans and groundnut cake for compounding livestock feeds, (Amaefule *et al.,* 2004). This limitation imposed by scarcity of the conventional feedstuffs has made it necessary to source for alternative and cheaper feed materials to supply nutrients in livestock rations. Such materials would totally or partially substitute the expensive and relatively unavailable conventional feedstuffs and this will directly reduce production cost and improve profitability.

The recent high cost of feed ingredients in particular has brought about the need to look inwards for alternative to the conventional feed resources. It is therefore imperative to explore other feed materials that are not useful to human (Mustapha and Tunde, 1990; Owen *et al.,* 2008). The limited supply of raw materials for the feed industry has resulted in a continuous increase in the cost of production, causing a phenomenal rise in the unit cost of products. The increase in the cost of grains in Nigeria has been related to its scarcity as a result of competition for these feed ingredients. To depend on alternative sources of ingredients, especially when it encouragesa shift to ingredients for which there is less competition, may help if the later is sufficiently available (Oluyemi and Robert, 2013).

Rabbit production is a veritable way of alleviating animal protein deficiency in Nigeria (Ajala and Balogun, 2004). The rabbit has immense potentials and good attributes which include high growth rate, high efficiency in converting forage to meat, short gestation period, and high prolificacy, relatively low cost of production, high nutritional quality of rabbit meat which includes low fat, low sodium, and low cholesterol levels. It also has a high protein level of about 20.8% and its consumption is bereft of cultural and religious biases (Biobaku and Oguntona, 1997). Although, they are herbivores, rabbits can feed on a wide variety of feeds from grasses, herbs, leafy weeds and vegetables to household wastes or garbage (Ajala and Balogun, 2004). The presence of caecal microbes enables the rabbit to digest large amounts of fibrous feed as most non ruminant species cannot (Taiwo *et al.,* 1999). This research was designed to evaluate the growth performance and the economics of production of weaner rabbits fed African locust bean leaf meal as partial replacement for 'Full-fat' soya bean as dietary plant protein sources.

MATERIALS AND METHODS

Experimental Design

Sixteen (16) weaner rabbits of 8-10 months of age with average body weight of 1,320 g ± 20 g were used for the experiment. The sixteen weaner rabbits were randomly allotted to four experimental diets that were replicated four times withone weaner rabbit per replicate in a completely randomized design (CRD). Feed and water were given *ad libitum* throughout the experimental period that lasted for five weeks. Four (4) experimental diets were formulated in which ALB leaf meal replaced 'Full-fat' soya bean at 0.00, 2.50, 5.00 and 7.50 levels tagged as diets 1, 2, 3 and 4 respectively as shown in Table 1.

The ALB leaf meal were analyzed for proximate composition according to the methods of A.O.A.C, (AOAC, 2005). The body weights, feed consumption and feed conversion ratio were measured as the performance parameters, and feed cost per kilogram weight gains were also calculated to show the cost effectiveness of using ALB leaf meal as partial replacement for soya bean as dietary plant protein sources for weaner rabbits.

Data Analysis

Data generated were subjected to analysis of variance (ANOVA) using general linear model procedure of Statistical Analysis System (SAS, 2009), where significant differences between the means exists, Least Significance Difference (LSD) method was used to separate the means.

Table 1: Percentage Composition of ALB Leaf Meal as Partial Replacement for 'Full-Fat' Soya Bean in Weaner Rabbits Diets

	Diets			
Ingredients	**1**	**2**	**3**	**4**
Maize	55.41	55.41	55.41	55.41
ALBLM	0.00	1.53	3.05	4.58
Soya bean 'Full-fat'	30.54	29.01	27.49	25.96
Wheat offal	10.00	10.00	10.00	10.00
Bone meal	3.00	3.00	3.00	3.00
+Premix	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Methionine	0.30	0.30	0.30	0.30
Lysine	0.20	0.20	0.20	0.20
Total	100.00	100.00	100.00	100.00
Calculated Analysis				
Crude Protein (%)	18.00	18.00	17.50	17.00
ME (kcal./kg)	2,978.41	2,974.20	2,970.01	2,965.79
Crude fibre (%)	3.65	3.85	4.05	4.25
Calcium (%)	1.19	1.20	1.20	1.20
Phosphorus (%)	0.76	0.76	0.77	0.77

RESULTS AND DISCUSSION

The chemical composition of ALB leaf meal is presented in Table 2. The result obtained showed a crude protein content of (12.02 %), this crude protein content is higher than 6.70 % reported by, (Kwari and Igwebuike, 2002), 6.62 mg/100g reported by (Alabi *et al.,* 2005), 5.25 g/100 g reported by, (Bello *et al.,* 2008) and 4.81 % (4.81 g/100 g) reported by, (Hassan and Umar, 2005). The differences could be due to variation in the soils in which they were grown as a results of fertility or differences in geographical locations. The crude fibre content was 3.20 % which is lower when compared to 12.00 g/100 g (12.00 %) reported by (Bello *et al.,* 2008); also lower than 18.00 g/100 g (18.00 %) reported by (Kwari and Igwebuike, 2002) and 30.65 mg/100 g (0.03065/100 g) reported by, (Alabi *et al.,* 2005). The lower fibre so obtained in this study is an advantage in that according to Shiawoya and Musa (2006), low fibre content of feed could stimulate feed intake as well as enhance the quality and digestibility of feed. The ether extract content was 3.02 % which is higher than the 1.80 % reported by, (Gernah *et al.* 2007) and also lower than 18 % reported by, (Bello *et al.* (2008). It is however comparable to 3.00 % reported by, (Kwari and Igwebuike, 2002).

The results of performance are presented in Table 3. All the parameters (i.e. total body weight gain, total feed intake, daily feed intake, daily weight gain and feed conversion ratio) measured were similar, except the final weights values (1012.50g - 1325.00g) that were significantly ($p<0.05$) affected, with the lowest value obtained in diet 2, while the highest was obtained in diet 4, this result is in conformity with values reported by earlier researchers in the tropics (Ayers *et al*, 2016; Okorie, 2013). The highest body weight gain was obtained at 10%

dietary inclusion level of ALB leaf meal, body weight gain in this study was between (441.70g – 811.00g) with an average daily Weight gain of 11.93g/day - 16.43 g/day. This result is lower than the values obtained by Obun *et al*. (2010), who reported daily weight gain of between 16.32-16.59 g/day and total body weight gain of between 914-929 g in weaner rabbits fed ALBLM for a period of 6 weeks, at 0, 5, 10 and 15 % dietary inclusion levels. FCR was between 2.52 and 4.02 with the diet 2 having the best FCR of 2.52, then followed by diet 3 (2.53) i.e. 5% inclusion of level. This result differed from the findings of Ogunsipe and Agbede (2010) who reported FCR of 7.21-9.15 when rabbits were fed *parkia biglobosa* fruit pulps.

Feed Cost (₦/Kg) decreases with increase in ALB leaf meal inclusion, while the Feed cost ₦/ Kg gain increases with inclusion level of ALB leaf meal in the diet. The control diet (0% ALB leaf meal) had the lowest feed costs ₦/ Kg gain, followed by diet 4. 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. This report is also in tandem with the one reported by Emmanuel *et al.,* (2016) when weaner rabbit rabbits were fed with dietary level of ALBML. The economics of production of ALBLM as a replacement for maize revealed that the production cost/kg diets and cost/kg weight gain decrease with increase inclusion of ALBLM.

Table 2: Proximate Composition of African Locust Bean Leaf

Nutrient	Composition (%)
Crude Protein	12.02
Ether Extract	3.02
Crude Fibre	3.20
Ash	0.68
Carbohydrates	81.00
Moisture Content	0.08

Table 3: Performance of Weaner rabbits fed ALB Leaf Meal as Partial Replacement for 'Full-fat' Soya Bean

Parameters	Diets				
	1	2	3	4	LSD
Initial Weight (g)	732.50[a]	437.50[b]	712.50[a]	850.00[a]	187.34*
Final Weight (g)	1150.00[ab]	1012.50[b]	1287.50[a]	1325.00[a]	255.97*
Total Feed Intake (g)	1368.69	1407.50	1343.57	1403.74	210.18[NS]
Daily Feed Intake (g)	39.11	40.22	38.39	40.11	0.01[NS]
Daily Weight Gain (g)	11.93	16.43	16.43	13.57	8.09[NS]
FCR	3.81	2.52	2.53	4.02	2.58[NS]
Mortality (Number)	0.00	0.00	0.00	0.00	-

[a, b] Means bearing different superscripts within the same row differ * = ($p<0.05$), NS = Not significant, LSD = Least Significant Difference

Table 4: Cost benefits Analysis of Weaner Rabbits fed African Locust Bean Leaf Based Diets

Parameters	Diets			
	1	2	3	4
Total Feed Intake (kg)	1.37	1.41	1.34	1.40
Feed Cost (₦)	909.58	903.34	893.74	890.95
Total Feed Cost (₦)	1246.12	1273.71	1197.61	1247.33
Feed Weight Gain (kg)	0.42	0.58	0.58	0.48
Feed Cost ₦/kg gain	523.37	738.75	738.75	598.72
Cost Savings (₦)	-	-215.38	-215.38	-75.35

CONCLUSION

Feed intake, body weight gains and FCR were enhanced as the dietary inclusion level of ALB leaf meal increased up to 5.00 % (diet 3). Therefore, it is recommended that rabbit farmers, animal nutritionists and feed millers could use ALB leaf meal as a feed resource in compounding the diets of weaner rabbits up to 5.00% inclusion level, since this point gave optimum performance in terms of feed intake, body weight gain, feed conversion ratio and lower feed cost in naira per kilogram gain.

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