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Growth performance and nutrient digestibility of weaner rabbits fed African locust bean (*Parkia biglobosa*) fruit pulp

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Abstract

The need to seek for alternative feed materials to replace maize as source of energy to support growth in weaner rabbits necessitated this study. A feeding trial of 84 days using unsexed rabbit crosses (New Zealand white and Chinchilla) was conducted to assess the replacement value of African Locust bean fruit pulp for maize in weaner rabbits diet. Five diets were formulated, such that 100% maize and 0.00% fruit pulp of African fruit pulp at (T1), 75% maize and 25% inclusion of African locust bean at (T2), 50% maize and 50% African locust bean pulp as (T3), 25% maize and 75% African fruit pulp at (T4) while (T5) contain 100% fruit pulp of African locust bean and 0.00% maize, respectively. Seventy-five (75) weaner rabbits with average initial weight between 610.67g - 622.60g were randomly allocated in a complete randomized design (CRD) experiment to the five diets with fifteen (15) weaner rabbits in each treatment which were subdivided into three (3) replicates having five (5) weaner rabbits in each replicate. The weaner rabbits were housed in individual cage compartment. Data collected were subjected to one-way analysis of variance (ANOVA). Proximate and Phytochemical composition of sun dried fruit pulp of African locust bean used in the diets showed dry matter content of 91.38 %, crude protein 6.70 %, crude fiber 11.21 % Ether extract 5.04 %, ash 5.02 and nitrogen free extract 63.41 %. The metabolizable energy contained in the ingredient was 3079.41 ME/Kcal/Kg. Proximate composition of the experimental diets fed to weaner rabbits carried out indicated that T1 had dry matter content of 93.28 %, crude protein of 19.80 % and 12.41 % of crude fiber. Ether extract was higher in T5 with 8.48 %, while nitrogen free extract contained in T3 had the highest value of 51.17 %. However, ash content in T5 has the highest value of 7.83 %. The metabolizable energy in all the dietary treatment shows that T5 had the highest value of 3013.21 ME/Kcal/Kg. Nutrient digestibility in weaner rabbits showed crude protein digested during the experimental work in the treatment ranged from 69.46 % to 73.73 %. Crude fiber digested was between the ranges of 42.20 % to 58.12 % in all the treatments. Ash content ranged from 50.18 % to 56.35. T5 has the highest percent nutrient of ether extract digested with 83.36 % while the lowest value was obtained in T1 with 58.99 respectively. Values in nitrogen free extract ranged from 65.20 % to 72.43 % and showed a significance difference ($P < 0.05$) in all the treatment. Data were collected on daily feed intake and weekly weight. Feed conversion ratio, protein efficiency ratio, energy efficiency ratio, nutrient digestibility and feed cost benefit N (kg) were calculated. Weaner rabbits fed 75% maize and 25% African fruit pulp (T2) consumed more feed and significantly gained more weight ($P < 0.05$) than those fed the other diets. Feed conversion, protein efficiency ratio and energy efficiency ratio were not significantly ($P > .0.05$) influenced by the treatment diets while nutrient digestibility showed a significance difference ($P < 0.05$) in all the treatments. Average feed cost/weight gain of production with maize was estimated at N311.25 in T1 while the African locust bean fruit pulp was N161.81 in

T5, a cost difference of N149.44, this resulted to a progressive reduction in the cost treatment of feed with increase in the level of fruit pulp of African locust bean meal. The results of this study indicated that when 25 % fruit pulp of African locust replaced maize, the rabbits performed better than the control diet and also of more economical option.

Keywords: Pulp, Weaner rabbits, Diet, Proximate, Nutrient, Digestibility.

Introduction

There is an estimate of an annual five to seven percent growth rates for meat consumption (FAO 2012), such increase cannot be met easily by large animals like sheep and cattle because of their slow production cycle, they may however be met by short cycle animals such as rabbits, poultry and pigs. The growing demand for maize in the last few years for both human and livestock consumption has pushed its market price to an alarming rate and that has directly affected the production cost of farm animals particularly the non –ruminants. (Igwebuike *et al.*, 2013). Available statistics indicated that Nigeria is one of the countries where the protein intake of the people ranks among the lowest. It is estimated that on the average, Nigerians consume only about 7g of animal protein on a daily basis, as against the minimum requirement of 28g/head/day recommended by food and agricultural organization. (Uchegbu *et al.*, 2011). Acute shortage and high cost of feed ingredients have been identified as major hindrance to the expansion of rabbit industry in Nigeria and other developing African countries (Fasuyi, 2009). Feed constitutes about 70-80% of the cost of producing rabbits (Aduku, 2009). The growing demand for maize in the last few years for both human and livestock consumption has pushed its market price to an alarming rate that has directly affected the production cost of farm animals, particularly the non-ruminants. This has invariably escalated the market prices of livestock products out of the reach of the common man. There is therefore, an urgent need for an alternative to maize in livestock feeds to reduce the current pressure on maize as staple food for man (Uchegbu and Udedibie, 2010). Rabbit rearing is gaining popularity for meat and besides as pet animal in our country. Rabbits are also reared for several reasons as it can be raised on roughage diet solely without affecting productive and reproductive performance (Das *et al.*, 20013), this indicates that it cannot compete with human beings for food grains like pig and bird. Its reproductive potentiality is very high that is rabbit can be bred around the year and gives at least four crops with five litters in each time, altogether 20 litter per doe per year. It is adaptable in a wide range of climate and resistant to diseases. It can be marketed at 90 days of age. Rabbit meat is wholesome; tasty which is rich in protein, contain minerals and vitamins but low in fat and cholesterol (Elamin, 2013). In an attempt to boost rabbit production nutritionists have tried to harness and utilize agro industrial by-products that are not directly utilized by man. A large number of alternative feedstuffs that have potential as rabbits feed ingredients abound in Nigeria (Ologhobo, 2012). Adeniyi and Balogun (2012) stated that research into the use of cheaper industrial by-products and wastes have been intensified in the last few years to determine the efficiency of their utilization in terms of growth and production. According to Fadipe (2010) the search for cheaper sources of feeding ingredients for livestock feeding in Nigeria and many developing countries will continue, as long as protein requirement in human diet has not been met. There are several attempts to reduce the cost of rabbit production by replacing some percentage of maize with

other agro-industrial by-products such as maize offal, brewers dried grain, wheat offal, cassava peel meal, rice offal, (Ademosun, 2011). One alternative novel feed ingredient that is receiving attention is the African locust bean fruit pulp. The pulp is obtained from the locust bean tree. The African locust bean, *Parkia biglobosa* is a perennial tree legume which belongs to the sub family *Mimosoideae* and family *Leguminosae*. It grows in the savannah region of West Africa up to the southern edge of the Sahel zone 13° N (Campbell-Platt, 2010).The trees of the Parkia species are usually and carefully preserved by the inhabitants of the area where they grow because they are valuable sources of reliable food, especially the seeds which serves as source of useful ingredients for consumption and further reported that the fruit of the plant is straight or sickle shaped, 15.6cm-31.20cm long and 2.6cm broad with thick waxy margin. When dried it is light brown with black seeds embedded in yellowish mealy tasting pulp (Edigwe *et al.*, 2012). According to Uwaegbute (2011) the powdery fruit pulp contains more carbohydrate than the seeds, the carbohydrate being primary reducing sugars, non reducing sugars and other complex carbohydrate. The major chemical component of maize is starch (Ogunbiade *at al.* 2012) which provide up to 72 – 73 percent carbohydrate weight and serve as energy source, other carbohydrate are simple sugars present as glucose, sucrose and fructose High carbohydrate content is needed in rabbit diet, a deficiency causes depletion of body tissue (Barger, 2013). The tree of African locust bean is naturally distributed in the natural grass land of the northern states and derived savanna zones of the west and southern part of Nigeria. The use of Parkia seeds as an alternative source of protein in livestock diets abound in literature, the use of the pulp is still being investigated. It is against this background that this study was designed to evaluate the nutritive value of Parkia fruit pulp in rabbit diets

Materials and methods

Experimental site

The experiment was carried out at the Rabbit Unit of Animal Teaching and Research Farm, Gidan Kwano, Federal University of Technology Minna, Niger State. Minna is located within latitude 09° 30' and 09° 45' north and longitude 06° 30' and 06° 45' east of the equator. It falls within the Southern Guinea Savannah agro-ecological zone of Nigeria. The mean annual rainfall varies from 1100 – 1600 mm and mean temperature of between 21°C and 36.5°C (FMSM, 2015)

Source of rabbits and experimental ingredients

Seventy-five mixed breed of weaner rabbits (New Zealand White and Chinchilla) were purchased from Ministry of Livestock and Fisheries Development, Minna, Niger State. Pulp of locust bean was purchased at Dandaudu village 56km away from Minna. African locust bean fruit pulp was sundried and packaged into sacks for storage prior to the commencement of the experimental work (Weibel and Devegowda 2012)

Experimental diets

At the commencement of the trial, the chemical compositions of dried African locust bean fruit pulp were carried out by the method of AOAC, (2000). Five dietary treatments were formulated at 16 % crude protein requirement with energy level of 2800 – 2900 ME/kcal/kg. Energy levels were calculated as 37 x CP (crude protein) + 81 x EE (ether extract) + 35.5 x NFE (nitrogen free extract) Ajayi *et al.*, (2012).

Each formulated diet in the treatment was labeled as T1, T2, T3, T4 and T5 respectively. Diet 1(T1 control) contain 100 %, maize diet and diet 2, 3, 4, with 25 %, 50 %, and 75 % inclusion of dried African locust bean fruit pulp while diet 5 contain 100 % fruit pulp of Africa locust bean as shown on Table 1

Experimental design

A total of seventy-five (75) rabbits of mixed sexes and breeds (New Zealand White and Chinchilla) were randomly allotted to five treatment groups as T1, T2, T3, T4, and T5 with three (3) replicate each, containing (5) rabbits in each replicate.

Management of experimental rabbits

Weaner rabbits were housed in a wooden hutch of height 60cm, length 45cm and width 40 cm with floor space of between 0.39 to 0.55cm, and 50 cm length with net fitting. Diets were fed to rabbit at 40 -100g. The hutches were enclosed in a house under intensive management system where the floor of the house was cemented. The walls were netted to the roof to prevent entry of foreign predatory and this also enhances cross ventilation. Prior to the feeding trial, the hutches were thoroughly washed with disinfectants (Vinkokill) at 40ml / 20 liters of water. Clean feeders and drinkers were placed in each cage for easy access by the rabbits and rabbits were de-wormed every two weeks with 3ml/kg of Albendazole (orally) against gastro intestinal worms, however Ivomectin was used for control of mange which was injected subcutaneously (SQ) every two weeks at 0.01/kg (Barger 2013). Broad spectrum antibiotic (oxytetracycline long Acting) was injected at 1m/kg intramuscular (IM) every two weeks against bacterial infection and one teaspoon of Vitalyte (ESMOVITA) to four litters of water was administered in drinking water to reduce often stress and improve appetite McMillan (2014). Dropped faeces on the wire nettings and concrete floor were thoroughly swept out of the rabbit pen.

Table 1 : Feed composition and calculated nutrients of experimental diets fed to rabbits at weaner stage

	Treatments				
INGREDIENT (%)	T1 100:00	T2 75:25	T3 50:50	T4 25: 75	T5 100:00
Maize	60.74	45.56	30.37	15.18	00.00
Locust bean fruit pulp	00.00	15.18	30.37	45.56	60.74
Soyabean meal	24.61	24.61	24.61	24.61	24.61
Rice husk	10.00	10.00	10.00	10.00	10.00
Bone Meal	3.00	3.00	3.00	3.00	3.00
Lysine	0.30	0.30	0.30	0.30	0.30
Methionine	0.80	0.80	0.80	0.80	0.80
Salt	0.30	0.30	0.30	0.30	0.30
*Premix	0.25	0.25	0.25	0.25	0.25
Total (kg)	100.00	100.00	100.00	100.00	100.00
Calculated nutrients					
Crude Protein	17.01	17.25	17.49	17.72	17.012
Crude Fiber	10.36	11.09	11.82	12.55	13.28
ME (Kcal/Kg)	2884.16	2788.22	2792.22	2796.22	2648.87
Protein: calorie Ratio	1:15	1:15	1:14	1:14	1:14
Calcium	1.40	1.45	1.47	1.49	1.51
Phosphorous	1.03	1.03	0.99	0.99	0.79
Methionine	1.01	1.00	0.98	0.97	0.96
Lysine	0.87	0.88	.088	0.88	0.89
Ether Extract	0.23	0.21	0.31	0.28	0.22

* = The premix provides nutrients kg^{1}: Vit. A, 500 IU; Vit. D_2, 1500 IU; Vit. E 3, IU; Vit. K,2 mg; Niacin, 15 mg; Vitamin B_{12},0.8 mg;Riboflavin, 3 mg; Pantothenic, acid 6 mg; Chlorine, 3 mg; Folic acid, 4 mg; Manganese, Iodine, 1.0 mg; Cobalt, 1.2 mg; 8 mg; Zinc, 0.5 mg.

Kg = kilogram ME = Metabolizable energy Kcal = Kilo caloric

Digestibility trial

During the last week of the feeding trial, the digestibility study was carried out. Two rabbits were removed from each of the replicate and placed in metabolic cage. The rabbits were allowed to acclimatize in the metabolic cage for a period of two days before the collection of the faeces, which lasted for another five days. This involves feeding the rabbits daily with the formulated feed at 100g. The feed intake of the rabbits was determined by finding the difference between the left over and the initial feed given. The faeces were collected daily and were weighed and dried at 80° C until a constant weight was obtained and then weighed to determine the moisture content, then 30 % of the total dried faeces for each day and for each replicate was taken to serve as representative sample for proximate analysis. The apparent Nutrient digestibility was calculated using the formula of Isikenuet *et al.* (2010).

$$\text{Nutrient Digestibility} = \frac{\text{Nutrient in feed intake} - \text{Nutrient voided in Faeces}}{\text{Nutrient in feed intake}} \times 100$$

Data collection

Initial body weight

Weaner rabbits were weighed on the first day of commencement of the experimental work

Feed intake (g)

Formulated diets were weighed daily each morning using Top Pan Weighing Scale (0 - 5kg) CAMRY model and given to rabbits in each replicate. Left over feeds were weighed the following morning. Feed intake was obtained by difference with feed given and the left over, as Feed intake (g) = feed given (g) – left over feed (g) on daily basis

Body weight

This was obtained by weighing the rabbits weekly in the replicate and dividing the weight obtained by the number of the rabbits in each replicate as,

$$\text{Body weight} = \frac{\text{Total body weight of rabbits (replicate) (g)}}{\text{Number of rabbits (replicates)}}$$

Body weight gain (g)

This was determined by subtracting the weight of preceding week from weight of current week.

Weight gain (g) = weight of the current week (g) – weight of the preceded week (g).

Feed conversion ratio (FCR)

From the weight gained by rabbits and feed intake on different treatment, the feed conversion ratio was calculated as:

$$\text{FCR} = \frac{\text{Average weekly feed intake (g)}}{\text{Average weekly weight gain (g)}}$$

Protein efficiency ratio (PER)

This was determined by calculating the ratio of weekly body weight gain to weekly protein consumed of each treatment of rabbits as expressed in the formula;

$$\text{PER} = \frac{\text{Average weight gain (g)}}{\text{Protein intake (g)}}$$

Where protein intake = Feed (DM) x percentage protein in diets as described by (Khiue *et al.*, 2012)

Energy efficiency ratio (EER): this was determined by calculating the ratio of weekly body weight gain to weekly energy consumed of each treatment of rabbits as expressed in the formula.

$$\text{EER} = \frac{\text{Average weight gain (g)}}{\text{Energy intake (g)}}$$

Where energy intake = feed intake (DM) x percentage energy in diets. (Akinola, 2015)

Cost /weight gain ((N/kg) = Feed Conversion Ratio x Average feed cost (N/kg). Yahaya, (2014)

Analysis of sample

Proximate composition of the feed and other samples was determined according to AOAC (2000) methods of analysis.

Data analysis

Data obtained from performance of weaner rabbits were all subjected to Analysis of Variance (ANOVA) using Statistical

Analysis System (SAS, 2010) and means, where significance observed were separated using Ducan multiple range test. (1955)

Results and discussion

Proximate composition of experimental diets fed to weaner rabbits containing various inclusion of sun dried African locust bean pulp.

Table 2 shows proximate composition of African locust bean fruit pulp. Dry matter content was 91.38 %, crude protein 6.70 %, crude fibre contained in the pulp was 11.21 %. Ether extract and ash found in the fruit pulp were 5.04 % and 5.02 % respectively, while nitrogen free extract was 63.41% with metabolizable energy of 3023.13 ME/Kcal/Kg. The high percentage of nitrogen free extract (carbohydrate) of 63.41% with metabolizable energy of 3023.13ME/kcal/kg serves as energy source to the rabbits, this agrees with findings of Moji *et al.* (2014) that the powdery fruit pulp contains 66.39 % of carbohydrate with metabolizable energy of 3079.14 ME/kcal/kg. The low fat content in the sun dried African locust bean fruit pulp is an indication that the pulp can be stored for a long period without spoilage by rancidity as reported by Sule *et al.* (2014).

Table 2: Proximate composition and energy content of sun- dried African locust bean fruit pulp

Parameters	% composition
Dry matter (%)	91.38
Crude protein (%)	6.70
Crude fiber (%)	11.21
Ether extract (%)	5.04
Ash (%)	5.02
Nitrogen free extract (%)	63.41
Metabolizable energy (Kcal/Kg)	3023.13

% - Percent Kcal – Kilo calorie Kg - Kilogram

Proximate composition of experimental diets fed to weaner rabbits containing various inclusion levels of sun dried african locust bean pulp

The Result of proximate composition of experimental diet of weaner rabbits containing different levels of African locust bean fruit pulp is presented in Table 3. The result showed the percentage dry matter ranged from 91.58 to 93.28%. This meets the requirement of (Moji *et al.*, 2014) who recommended dry matter of 88.45% for weaner rabbits. The crude protein of 16.01 % to 17.68 % used in this study is in line with the recommendation of Dennis, (2012); who suggested 16 % -17 % crude protein requirements in weaner rabbits. The metabolizable energy of 2953.02 – 31.47.48 ME/Kcal/Kg of the diet used during experimental work meets the recommendation of Moji and Sanuran (2014) who recommended energy requirement of growing rabbit from 2500 to 2700 ME/Kcal/K. The crude fibre obtained in this study ranged from 12.08 % to 12.74 % agrees with the repot of (Oluyemi and Roberts, 2010) who reported that fibre in weaner rabbit diet above 17% reduced performance and recommended range from 12-13%.

Table 3: Proximate composition and calculated energy values of experimental diets fed to weaner and post wean rabbits

Parameters	Treatments T1	T2	T3	T4	T5
Dry matter (%)	93.28	92.22	91.58	92.42	92.10
Crude protein (%)	17.41	16.68	16.01	16.44	15.85
Crude fiber (%)	12.71	10.44	10.26	10.74	10.47
Ether extract %	5.19	7.21	7.97	8.26	8.48
Nitrogen free extract (%)	51.14	50.30	50.17	49.79	49.47
Ash (%)	6.83	7.59	7.17	7.19	7.83
ME (Kcal/Kg)	3231.21	3063.02	2953.02	2915.82	3102.12

% - Percent
T1- 100 % Maize and 0.00 % Fruit pulp of African locust bean
T2- 75 % Maize and 25 %, Fruit pulp of Africa locust bean
T3- 50 % Maize and 50 % Fruit pulp of Africa locust bean
T4- 25 %, Maize and 75 % Fruit pulp of Africa locust bean
T5- 100 % Fruit pulp of Africa locust bean and 0.00 % Maize
Kg - Kilogram
Kcal – Kilo calorie
ME = Metabolizable energy
Metabolizable Energy
(ME/Kcal/kg) (Metabolizable Energy /Kilocalorie/Kilogram)

Growth performance characteristics of weaner rabbits fed various inclusion levels of sun dried African locust bean fruit pulp

The result of growth performance characteristics of weaner rabbits fed inclusion levels of sun dried African locust bean fruit pulp is presented in Table 4. The result revealed that no significance difference in initial weight of the rabbits. The best performance in average final weight, average weight gain, average daily weight gain, feed conversion ratio, protein efficiency ratio, and energy efficiency ratio in rabbits fed 25 % inclusion levels of sun dried African locust bean fruit pulp might be attributed to high nutrient, this agrees with the work of (Adejinmi *et al.*, 2010) that weaner rabbits perform better with adequate and required crude protein in the diet. High weight gain obtained by the weaner rabbits in this study could be as a result of high feed intake and this agrees with the findings of Afolanyan *et al.* (2013) who reported that final weight and final weight gain is directly proportional or related to feed intake. The high feed intake at 25 % inclusion levels of sun dried African locust bean fruit than 50 %, and 75 % could be as a result of low levels of sweetness in the diet as reported by Adegbenro (2013) that the low levels of sweetness of sun dried African locust bean fruit pulp can yield a higher intake of feed by weaner rabbits. The low value of feed conversion ratio obtained in 25 % inclusion of sun dried African locust bean for weight gain is lower, this is in line with the report of Raharjo (2011) that the higher the weight gain value, the lower the value of feed conversion ratio.

Nutrient digestibility of weaner rabbits fed diets containing various inclusion levels of sun dried African locust bean fruit pulp as replacement for maize

Table 5 shows result on nutrient digestibility of weaner rabbits fed diets containing various inclusion levels of sun dried African locust bean fruit pulp as replacement for maize. During the study the result showed a significance difference ($P < 0.05$) in crude protein, crude fiber, ash, ether extract and nitrogen free extract digestibility with numerically highest in in crude protein fed diet with 25 % inclusion of African locust bean fruit pulp indicating efficient utilization of the diet and this

Table 4: Growth performance characteristics of weaner rabbits fed diets containing inclusion levels of sun dried African locust bean fruit pulp as replacement for maize

Parameters	Treatments T1	T2	T3	T4	T5	±SEM	LS
Average initial weight (g)	610.67	616.67	622.00	622.00[a]	618.67	25.9	NS
Average final body weight (g)	1508.33[ab]	1561.67[a]	1413.33[c]	1396.67[c]	1455.67[bc]	20.06	**
Average weight gain (g)	897.67	945.00	791.33	774.67	839.00	38.86	NS
Average daily weight gain (g)	10.69	11.23	9.43	9.22	9.96	0.46	NS
Total feed intake (g)	3603.33	3631.66	3609.83	3377.00	3375.10	165.27	NS
Feed conversion Ratio	4.06	3.75	4.56	4.40	4.03	0.3	NS
Protein efficiency Ratio	2.22	2.36	2.45	2.22	2.31	0.11	NS
Energy efficiency Ratio	1.31	1.35	1.33	1.24	1.21	0.06	NS
Mortality (%)	0.00	0.00	0.00	6.67	6.67	0.42	NS

[abc] Means in the same row with different superscript are significantly different
T1- 100 % Maize and 0.00 % Fruit pulp of African locust bean
T2- 75 % Maize and 25 %, Fruit pulp of Africa locust bean
T3- 50 % Maize and 50 % Fruit pulp of Africa locust bean
T4- 25 %, Maize and 75 % Fruit pulp of Africa locust bean
T5- 100 % Fruit pulp of Africa locust bean and 0.00 % Maize
SEM – Standard error of mean; LS – Level of significance; ** Significant at ($P < 0.05$); NS Not Significant ($P > 0.05$);
g – gram; Kg – kilogram

agrees with the work of Onifade and Tewer (2011). The crude fibre digestibility obtained during the study had average values, this agrees with the work of (Lang, 2011) who obtained average digestibility of crude fiber ranging from 42.20 to 58.12 % with significance levels and concluded that fiber content determine the digestibility pattern in diets. The ether extract digestibility of the diets obtained during the study were similarly high amongst the treatments, this is in line with the work of (Rahajo 2011) who obtained 56.00 to 82.32 % and attested that the values gotten showed good ability of weaner rabbits to utilize dietary fat. High values obtain for nitrogen free extract during the study indicated a considerable extraction of energy from the diets so that rabbits could satisfy their energetic requirements and this is in line with the findings of Cheeke *et al.* (2011) that high values of digestibility in nitrogen free extract improves performances in weight gain, and feed intake in weaner rabbits.

Table 5: Nutrient digestibility of weaner rabbits fed various inclusion level of sun dried African locust bean pulp as a replacement for maize (%)

Parameter	T1	T2	T3	T4	T5	SEM	LS
Crude Protein	70.23[c]	73.73[a]	71.23[b]	71.20[b]	69.46[c]	0.2	**
Crude fiber	42.20[c]	43.24[c]	56.22[b]	56.72[ab]	58.12[a]	0.5	**
Ash	50.18[b]	56.30[a]	56.35[a]	46.94[c]	45.43[d]	0.2	**
Ether Extract	58.99[c]	75.31[c]	69.63[b]	81.21[b]	83.36[a]	0.2	**
NFE	72.43[ab]	74.90[b]	70.90[ab]	65.20[c]	76.52[a]	0.2	**

[abc] Means in the same row with different superscript are significantly different
T1- 100 % Maize and 0.00 % Fruit pulp of African locust bean
T2- 75 % Maize and 25 %, Fruit pulp of Africa locust bean
T3- 50 % Maize and 50 % Fruit pulp of Africa locust bean
T4- 25 %, Maize and 75 % Fruit pulp of Africa locust bean
T5- 100 % Fruit pulp of Africa locust bean and 0.00 % Maize
SEM – Standard error of mean; LS – Level of significance; ** Significant at ($P < 0.05$); NS Not Significant ($P > 0.05$)

Economy of feed conversion of weaner rabbits fed diets containing various levels of sun dried African locust bean pulp as replacement for maize (N/Kg)

Table 6 shows economy of feed conversion of weaner rabbits fed diets containing various levels of sun dried African locust bean pulp as replacement for maize (N/kg). The high inclusion levels of maize at 100 % showed average feed cost/weight gain of N311.25/kg compared to weaner rabbits fed with 100% fruit pulp with average feed cost/weight gain of N161.81/kg, this gave rise to cost differential of N149.44/kg and this resulted to reduction in the feed cost/kg as levels of African locust bean fruit pulp increases in all the treatments, this agrees with the work of Maidala (2015) that with increase in African Locust bean fruit pulp in the diet of rabbits, decreases the cost of feed.

Table 6: Economy of feed conversion ratio of weaner rabbits fed various level ofsun dried fruit pulp of African Locust bean (₦/Kg)

Treatment	T1	T2	T3	T4	T5	±SEM	LS
Average Feed Intake (g)	3603.26	3631.66	3609.66	3377.00	3375.10^{a}	165.27	NS
Average Feed Cost (₦/kg)	76.60^{a}	67.50^{b}	58.38^{c}	47.24^{d}	40.12^{e}	0.00	**
Total Cost of Feed (₦)	276.01^{a}	245.13^{b}	210.74^{c}	159.53^{d}	135.41^{e}	7.36	**
Average Weight Gain (g)	897.66	944.00	791.33	774.66	837.00	38.88	NS
Feed Conversion Ratio	4.06	3.75	4.56	4.40	4.03	0.3	NS
Cost/Weight Gain (₦/Kg)	311.25^{a}	253.25^{ab}	266.21^{ab}	192.8^{bc}	161.81^{c}	21.04	**

^{abc} Means in the same row with different superscript are significantly different

T1- 100 % Maize and 0.00 % Fruit pulp of African locust bean

T2- 75 % Maize and 25 %, Fruit pulp of Africa locust bean

T3- 50 % Maize and 50 % Fruit pulp of Africa locust bean

T4- 25 %, Maize and 75 % Fruit pulp of Africa locust bean

T5- 100 % Fruit pulp of Africa locust bean and 0.00 % Maize

SEM – Standard error of mean; LS– Level of significance; ** Significant at ($P < 0.05$); NS Not Significant ($P > 0.05$);

g – gram; ₦ – Naira; Kg – kilogram

Conclusion

Based on the findings of this study sun dried African locust bean fruit pulp at 25 % inclusion can successfully replace maize in the diet of weaner rabbits and could enhance a higher weight gain with better feed conversion ratio. Also, its inclusion in the diets of weaner rabbits will not have any negative effect on physiological, pathological and nutritional status of the rabbits. It is recommended that nutritive value of sun dried African locust bean fruit pulp could be an alternative to high cost of maize in weaner rabbit production.

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