

Carcass characteristics and economic performance of rabbits fed on graded levels of dried okra leaves (*Abelmoschus esculentus*)

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Target Audience: Local Farmers, Rabbit Breeders, Animal Nutritionist

Abstract

A ten week feeding trial was conducted to evaluate the effects of dried okra leaves (DOL) on Carcass characteristics and Economic performance of growing rabbits. Forty-five unsexed Rabbits crosses (Chinchilla X New Zealand white) 5- 6 weeks old with average weight of 720g were used for this experiment. The rabbits were assigned into five treatment groups (T₁, T₂, T₃, T₄, and T₅) containing DOL at 0.00%, 2.50%, 5.00%, 7.50% and 10.00% respectively. inclusion levels for dietary treatments (T₁, T₂, T₃, T₄ and T₅) respectively. Each treatment contains 9 rabbits of three replicates with each replicate consisting of 3 rabbits in a completely randomized design. The rabbits were supplied with the diets and cleaning drinking water ad libitum. Results obtained shows that carcass characteristics of growing rabbits fed diets with graded levels of DOL indicated that live weight, carcass weight, dressing percentage, loin, hind limb, fore limb, tail, liver and kidney did not differ significantly ($P>0.05$) by dietary treatments. Neck, chest and heart of rabbits fed diets with 2.50% DOL increased ($P<0.05$) compared to those on the other treatment groups. Cost of total feed consumed was least in 0.00% (₦524.72k) while rabbits fed 5.00% dried okra leaves had the largest value of (₦673.73k). This study recommended that up to 2.50% inclusion level of dried okra leaves could be tolerated by the rabbits to obtain enhanced of live body weight, enhance feed intake and improve feed efficiency. Inclusion of 2.50% DOL recorded superior feed cost per kg/gain than the other diets.

Key words: Carcass Characteristics, Performance, Dried okra leaves, Rabbits

Description of Problem

The rabbit (*Oryctolagus cuniculus*) is the most productive meat producing among all domesticated animals. The feeding habits offer no appreciable competition with man. This is because it can subsist on green as basal diets (1). The combinations of these characteristics are unique. In addition to this, rabbits have a number of other characteristics that might be advantageous to subsistence farming system, such as their small body size, short generation interval with a relatively short gestation period average of 30-31 days (2). The daily weight

gain is high in proportion to the body weight which gives them a rapid growth rate, and sexual maturity is early (2). These factors result in the rabbit reaching the weight of a sexually mature animal 30% faster than other animals (1) and also make rabbits suitable as meat producing small livestock in developing countries (3). Rabbit has greater ability to efficiently convert leaf meal and agro-industrial by-products into meat compared to other ruminant livestock (4). This has necessitated the need to seek for alternative feed sources in forages. The use of okra leaves as forage is among the

possible alternatives (5). This is especially so because of the greater availability of okra leaves and ability of rabbits to convert okra leaves into meat for human consumption (6). Okra leaves are also good source of calcium and potassium. Due to the presence of many vitamins and minerals in okra leaves, it provides a very good antioxidant activity (7). Okra has important sources of ingredients for use as functional foods (8). World production of okra as fresh vegetables is estimated at six million tonnes per year (9). Furthermore, the ability of rabbits to perform well on unconventional feed is an added advantage. This study was designed to investigate the effect of feeding with dried okra leaves on carcass characteristics and economic performance for growing rabbits.

Materials and Methods

Study Location: The experiment was conducted at the rabbitary unit of the Directorate of University Farms (DUFARMS) Federal University of Agriculture Alabata road, Abeokuta, Ogun state.

Source of Ingredients: The fresh forage (okra leaves) were purchased from a reputable farmer in Igboora, Oyo state. The ingredients for the formulation of the concentrate ration were purchased in Abeokuta, Ogun state.

Experimental diets: At the commencement of the trial, the chemical compositions of dried okra leaves were carried out by the method of (10). Five treatment diets (T1,T2,T3 T4 and T5) were formulated. Diet 1 contained 0 % DOL while 2, 3, 4 and 5 with 2.50%, 5.00%, 7.00% and 10.00% DOL respectively. The composition of the okra leaves and Composition of the five trial diets

are summarized in Tables 1 and 2 respectively.

Management of the Experimental

Animals: Forty-five (45) unsexed rabbits crosses (Chinchilla x New Zealand White) of 5 - 6 weeks of age and weight range of 720g-750g were used in the ten weeks feeding trial and were assigned to 5 treatment groups using completely randomized design of 9 rabbits per treatment. The rabbits were individually housed in wooden hutches and subjected to two weeks acclimatization period. They were treated against potential endo- and ecto-parasites and fed diet containing 17% crude protein and about 2300 kcal/kg metabolizable energy and they were balanced for weight The rabbits were weighed at the commencement of the experiment and subsequently once per week. The cages were slightly raised above the floor for easy collection of faeces and cleaning. Plastic drinkers and metallic feeding troughs were provided in each cage. The drinkers were washed daily. The rabbits were fed ration of 100g in two installments at 8.00 am and 4.00pm. The five experimental diets were formulated as shown in Table 1. Diet 1 was the control and had no DOL. Variation in the diets were achieved by adding 2.50%, 5.00%, 7.50% and 10.00% respectively. Each of the diet contained at least 17% crude protein (Table 2).

Table 1: Proximate analysis of okra leaves

Parameter	Composition (%)
Dry Matter	18.50
Crude protein	23.80
Crude fibre	11.40
Ether extract	3.20
Ash	11.90
Calcium	28.80
Phosphorus	3.80
Energy (MJ/Kg)	11.59

Table 2: Gross composition of Experimental diets for growing rabbits fed on diets containing graded levels of dried okra leaves (DOL)

Ingredients	Basal(BD) Diet	BD+2.5% DOL	BD+5.00% DOL	BD+7.50% DOL	BD+10.00% DOL
Maize	41.00	41.00	41.00	41.00	41.00
SBM	6.00	6.00	6.00	6.00	6.00
PKC	8.00	7.50	6.00	5.00	4.50
GNC	9.00	8.00	7.50	7.00	6.00
Rice bran	9.00	8.00	7.50	6.50	5.50
Wheat Offal	22.00	22.00	22.00	22.00	22.00
Bone meal	2.00	2.00	2.00	2.00	2.00
Fish meal	2.00	2.00	2.00	2.00	2.00
Premix	0.50	0.50	0.50	0.50	0.50
Salt(NaCl)	0.50	0.50	0.50	0.50	0.50
Okra Leaves	0.00	2.50	5.00	7.50	10.00
Total	100.00	100.00	100.00	100.00	100.00
Calculated analysis of concentrate diets					
Crude protein	17.22	17.13	17.03	17.18	17.09
Crude fibre	13.30	13.35	13.50	13.50	13.45
Fat	4.97	4.81	4.65	4.54	4.38
Ca	1.05	1.06	1.08	1.09	1.11
ME (MJ/kg)	2691.16	2695.24	2695.32	2700.36	2704.44

*1kg of vit/mineral premix contained: Vitamin A, 10,000,000 IU, vitamin D₃ 200,000 IU, vitamin E 12,500 IU: vitamin K, 1.30g., vitamin B₁ 1.30mg, vitamin B₂ 2,000mg, vitamin B₆ 1.30g; Nicotinic acid, 15.00g 12,000mg; Pantothenic acid 20.00mg Biotin 10.00mg; vitamin B₁₂ 0.01g; folic acid 0.05g; biotin 0.02g; chlorine chloride 200.00g; Manganese 48.00g; Zinc 45.00g; Copper 5.00g; Fe 25.00g; cobalt 0.20g; selenium 0.10g. BHT, 50.00g.

SBM---soya bean meal, PKC---palm kernel cake, GNC---groundnut cake

Data Collection

Carcass Evaluation: At the end of the experiment (eight weeks) all the rabbits were slaughtered. Prior to slaughtering, the rabbits were tagged, fasted for 12 hours and weighed to determine the final live weight. The fur was removed by scalding. Evisceration was carried out immediately by removing the viscera and intestine. The weight of the carcass, head and internal organs were taken. Five gram samples of the left thigh muscles were collected from all the animals for proximate analysis of the nutrient content (protein, fat and ash). The dressed carcass weight was measured as the portion of the animal remaining after the removal of the head, feet, skin (pelt) and the

visceral organs including the kidneys. The dressing percentage was calculated by expressing the dressed weight as a percentage of slaughter weight.

$$\text{Dressing percentage (\%)} = \frac{\text{Carcass weight (g)} \times 100}{\text{Live weight (g)}} \quad 1$$

Economic parameters: The economic implication of including dried okra leaves into the diets of growing rabbits was assessed by calculating the:

- (a) Cost per kilogram of each diet
- (b) Cost of feeding the rabbits on their respective diets throughout the experimental period.

- (c) Cost per kilogram of weight gain by the rabbits

Growth performance characteristics: At the end of the feeding trial, weight change of the rabbits was obtained by subtracting the initial weight from the final weight. Feed intake was determined by subtracting feed left over from feed offered to the animals. Feed conversion ratio (FCR) was determined by calculating the ratio of daily feed consumed in gram to daily weight gain in gram per treatment.

Chemical and Statistical analysis: The proximate analysis of the experimental diets and DOL was carried out according to (10) method. Data collected were subjected to one-way analysis of variance in a Completely Randomized Design (CRD). Data were analyzed using SAS Package. Significant means were separated and compared using Duncan Multiple Range Test of the SAS package at 95% level of probability.

Results and Discussions

Carcass Parameters:

The carcass measurements of the rabbits and the various body components expressed as percentage of slaughter weights are shown in Table 3. The weight of the rabbits before fasting and the slaughter weights were not significantly difference ($P>0,05$) in all the diets. The slaughter weight obtained in this study ranges from 1100.00g to 1450.33g which is lower than the range of 1695.00g to 2050.00g obtained by (11) for rabbits of similar ages. The differences in slaughter weight may be due to breed difference (11) used New Zealand white rabbits which were reported to be heavier than most indigenous breeds of rabbits. (12) observed that New Zealand white rabbits have faster growth and rate of gain than most other breeds whereas mixed

breeds (Dutch X New Zealand white) of rabbits were used in this experiment. The dressing percentage obtained in this study (69.61%-76.33%) were higher to 50.00%-65.00%) reported by (13) observed that dressing percentage will tend to be 50% or less if the rabbit slaughtered is young or thin. (13) obtained dressing percentage 52.80% and 54.10% from rabbits weighing 1.63kg and 1.86kg respectively. The body components / organs measured were head, skin (pelt), feet, heart, lungs, kidneys, gastrointestinal tract, stomach, small and large intestines, caecum, and kidney fat. They were all weighed and expressed as percentage of slaughter weights and subjected to analysis of variance. They were found to be similar ($P>0.05$) in all treatments except for neck, chest, back gastrointestinal tract, heart and lungs. Which showed significant difference ($P<0.05$). The figures for body components were similar to those reported by (14) for healthy rabbits. This indicates that the growth and development of these organs / components were not adversely affected by the various levels of dried okra leaves in the diets. This agrees with the observation of (15) who reported that in rats, the relative sizes for liver, heart, and kidneys are hardly affected by the fibre levels of the diets.

Economic Analysis:

The economic performance presented in Table 4 showed that cost of feed per kg, and cost of total feed consumed increased with increasing levels of dried okra leaves inclusion. This observation is in line with the report by (16) who observed increases in feed cost with increasing inclusion of cassava leaf meal in the diets of rabbits. This observation could be due to the increase in conventional feed material which is usually expensive. The study showed that, it would be more economical and better to utilize diet with 2.50 % dried okra leaves.

Table 3: Carcass Measurements of Rabbits fed Diets containing varying levels dried okra leaves (*Abelmoschus esculentus*)

Parameters	Levels of inclusion of okra dried leaves (%) (ODL)					SEM	P Values
	0.00	2.50	5.00	7.50	10.00		
Live weight (g/rabbit)	1583.33	1900.10	1800.78	1700.50	1580.33	22.88	0.706
Carcass weight (g/rabbit)	1150.33	1450.33	1300.67	1250.67	1100.00	19.72	0.880
Dressing percentage (%)	72.65	76.33	73.63	72.23	69.61	1.00	0.252
Cut parts (%)							
Head	8.51	8.63	8.67	7.92	8.13	0.13	0.303
Neck	3.22 ^{ab}	3.91 ^a	2.98 ^{ab}	2.32 ^b	2.72 ^b	0.19	0.505
Loin	14.96	14.70	17.76	16.49	14.05	0.59	0.504
Hind limb	16.37	16.22	15.11	15.40	14.70	0.33	0.486
Fore limb	9.90	7.79	9.92	9.99	9.750	0.35	0.232
Tail	0.54	0.54	0.57	0.47	0.62	0.26	0.554
Chest	7.92 ^b	10.99 ^a	8.55 ^{ab}	7.43 ^b	8.82 ^{ab}	0.43	0.055
Back	7.24 ^a	6.33 ^{ab}	4.98 ^b	4.75 ^b	3.81 ^b	54.05	0.452
GIT	10.83 ^b	12.81 ^{ab}	11.05 ^b	12.57 ^{ab}	14.28 ^a	0.47	0.105
Organs (%)							
Liver	2.5	2.68	2.37	2.50	2.70	0.87	0.782
Kidney	0.84	0.79	0.77	0.76	0.73	0.31	0.899
Heart	0.25 ^{ab}	0.27 ^a	0.18 ^b	0.19 ^b	0.22 ^{ab}	0.11	0.022
Lungs	0.46 ^b	0.44 ^b	0.57 ^{ab}	0.47 ^{ab}	0.67 ^a	0.10	0.031

^{ab} --- Means in the same row with different superscripts differ significant (P<0.05)

SEM = Standard error of means

GIT = Gastro-intestinal tract

Table 4: Economic performance of Rabbits fed on diets containing varying levels of dried okra leaves (*Abelmoschus esculentus*)

Parameters	Levels of Inclusion of dried okra leaves (%)					SEM	P Value
	0.00	2.50	5.00	7.50	10.00		
Initial weight (g/rabbit)	740.50	750.00	745.50	750.00	720.67	13.49	0.263
Final weight gain (g/rabbit)	1583.33	1900.10	1800.78	1700.50	1580.34	22.88	0.002
Total weight gain (g/rabbit)	842.83	1150.10	1055.28	950.50	859.67	20.88	0.003
Total feed Intake(g/rabbit)	5648.33 ^b	5799.99 ^b	5894.45 ^{ab}	5899.77 ^{ab}	5920.22 ^a	97.90	0.013
Feed efficiency ratio(FER)	0.17 ^{ab}	0.20 ^a	0.18 ^{ab}	0.16 ^b	0.15 ^b	0.10	0.018
Feed cost/kg (₦)	103.94	104.64	105.49	106.52	107.72	7.52	0.002
Cost of total feed consumed (₦)	524.72 ^b	606.91 ^b	621.81 ^a	628.44 ^{ab}	637.73 ^{ab}	10.22	0.010
Feed cost/kg gain	17.67	20.93	18.99	17.04	16.16	4.50	0.008

Cost per kilogram of the various ingredients used in compounding the experimental diets as at December, 2017.

Maize—₦110.00; **Wheat offal**—₦ 60.00; **Groundnut cake**, ₦125.00; **Rice bran**—₦60.00; **Palm kernel cake**— ₦ 60.00, **Fish meal (72%)**—₦800.00; **Bone meal**—₦65.00 **Salt**—₦40.00..**Premix (growers)**— ₦620.00 and **Okra leaves**—₦100.

Conclusion and Applications

1. Inclusion of DOL up to 2.5% in the diets enhanced the carcass parameters

in terms of body weight gain, feed consumption, and feed conversion ratio in growing rabbits.

2. This present experiment has shown that the DOL is a potential good source of protein and could meet the needs the requirements of rabbits.
3. Okra leaves improves the efficiency of protein digestion in the caecum and nutritional status when successfully incorporated into the feeding regime of rabbits.
4. For improved economic cost benefit, DOL inclusion level up to 2.5% is recommended because of its impact on feed cost reduction. However, higher levels could affect profitability.

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