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Growth Performances and Cost Analysis of Weaner Rabbits Fed Varying Dietary Levels of Crude Protein Supplemented with *Tridax procumbens*

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Abstract: Growth performance and cost benefit implications of feeding weaner rabbits on concentrate diets supplemented with *T. procumbens ad lib.* was investigated in a Completely Randomized Design (CRD) experiment comprising four treatment groups. Thirty-six weaner rabbits were involved in the experiment. Nine rabbits randomly assigned to each of the four treatment groups consisting of the following: Diet 1 = 12% CP with Tridax, Diet 2 = 14% CP with Tridax, Diet 3 = 16% CP with Tridax and Diet 4 = 16% CP without Tridax as the control. The treatments were replicated thrice. The feeding trial lasted for forty-two days during which data on body weight and weight gains, feed intake and Feed Conversion Ratio (FCR) were collected. The data collected were subjected to cost/benefit evaluation and statistical analysis using S.A.S. (2002) software package. Dietary treatments produced significant ($p < 0.05$) effects on feed consumption, body weights and weight gains, FCR, production costs and profit margins. Rabbits fed concentrate diets containing 14% CP+ Tridax supplement had the best feed conversion ratio, least production cost/per kg of body weight gain and highest profit margin than the other treatments. Based on the results, therefore, it is advisable to produce rabbits on diets formulated on 14% CP supplemented with Tridax ad lib if the producer's objective is to maximize profit.

Key words: Tridax supplement, rabbits, crude protein level, growth performance, profit margin

INTRODUCTION

The rapid increase in the world population in general and in the Nigeria population in particular has aggravated the animal protein deficiency. F.A.O. (2006) estimated the average animal protein consumption in Nigeria to be 7.4 g per capita/day as compared with 38 g per capita/day of animal protein consumed in South Africa. The increasing demand for animal protein indicates the need to intensify livestock production. Poultry production which was seen as the quickest way to bridge this animal protein deficiency gap has been observed to be characterized by high cost of production due to high cost of feeds which accounts for more than 70-80% of the total production costs. (Ojebiyi *et al.*, 2006). As a result of this high cost of production in the poultry sector, most of the livestock producers are shifting to other farm animals where the cost of production is tolerable hence rabbitry is fast becoming popular. The rabbit has been identified to possess the potential of becoming an important source of animal protein with its ability to utilize efficiently forage, a cheaper feedstuff. (Anugwa *et al.*, 1982). Though rabbits have found to perform best when fed on concentrates, (Farinu, 1994), the ever increasing costs of grains has created a need to augment both the energy and protein requirement with forage in order to reduce the quantity of the more expensive feed ingredients. For any livestock

enterprise to be profitable and sustainable, it has become necessary to find alternative cheap feedstuff which can adequately replace the more expensive and highly competitive ones. (Akpodiete *et al.*, 1999). Farinu, (1994) 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 rear rabbits on mixed diet of concentrate and forage. Roy *et al.* (2002) investigated the effects of different sources of protein on growth and reproductive performances of rabbits and concluded that supplementation of grain as protein source may be used for production of rabbit fed *ad libitum* green grass. This study was, therefore, conducted to determine the growth performance and cost benefits of feeding weaner rabbits on diets with varying levels of crude protein supplemented with *Tridax procumbens* with a view to making rabbit production economical, profitable and sustaining.

MATERIALS AND METHODS

Thirty-six 5-6 week old hybrid weaner rabbits derived from crosses between New Zealand White and Chinchilla breeds of mixed sexes were used for the feeding trials at the Rabbit Unit of Delta State University, Asaba Campus, Asaba Delta State of Nigeria. There were four treatment groups made up of the following:

Diet 1 = 12% CP supplemented with *Tridax procumbens*
 Diet 2 = 14% CP supplemented with *Tridax procumbens*
 Diet 3 = 16% CP supplemented with *Tridax procumbens*
 Diet 4 = 16% CP without *Tridax* supplementation
 (control).

Diet 4 was deprived of forage as a control in order to determine the growth and cost benefit implications of feeding weaner rabbits on concentrate formulation alone. Nine rabbits were assigned to each of the four treatment groups in a Completely Randomized Design (CRD). Each treatment group was replicated thrice with a colony of three rabbits per replicate. The chemical composition of the experimental diets were assayed according to the Association of Official Analytic Chemist (AOAC) methods (1980).

The rabbits were subjected to four days stabilization period before commencing the experiment. Weighed quantities of feed were supplied to the experimental animals once daily in the morning. Earthen pots were used as the feeders and drinkers while the forage was suspended on the forage racks. The feeding trials lasted for forty-two days. During the experimental period, the following data were collected: initial body weight at day one, weekly body weight and weight gain, daily feed intake and feed conversion ratio. The data collected were subjected to analysis of variance using Genstat (2005) software package. Significant means were using Duncan's Multiple Range Test of the same package. Costs/benefit analysis was also carried out to determine the least/maximum profit diet combination.

RESULTS

The ingredient composition of the experimental diets are presented on Table 1 while the results of the chemical analysis of the nutrients composition of the experimental diets are presented on Table 2. The diets were deliberately formulated to ensure that the experimental diets were iso-caloric but not iso-nitrogenous. Feed intake and growth performance of rabbits fed varying levels of crude protein with and without forage (*Tridax procumbens*) supplementation are presented on Table 3. From the Table, it can be observed that feed intakes among the various dietary treatments differed significantly ($p < 0.05$). The average feed intakes were 94.10, 85.26, 96.53 and 109g, for rabbits in diet groups 1, 2, 3 and 4 respectively. The feed intake for rabbits placed on control diet (D 4 = 109.00 g) was significantly ($p < 0.05$) higher than the rest of the other diet groups while the rabbits placed on Diet 2 had the least feed intake. (85.26 g).

With respect to FCR, it was observed that it was significantly ($p < 0.05$) higher in the rabbits on Diet 2 (5.11) than the other diet groups while Diet 4 produced the poorest FCR (7.66).

Dietary treatments produced significant ($p < 0.05$) effects on the daily body weight gains. It was observed that

Table 1: Composition (%) of the experimental diets

Ingredients	Diet groups			
	D 1	D 2	D 3	D 4
Maize	30.00	30.00	30.00	30.00
Soya bean meal	5.40	6.50	12.65	12.65
Palm kernel meal	10.00	10.00	10.00	10.00
Fish meal	0.50	0.50	0.50	0.50
Wheat offal	10.00	10.00	10.00	10.00
Maize offal	40.60	39.00	33.35	33.35
Bone meal	2.00	2.00	2.00	2.00
Oyster shell	1.00	1.00	1.00	1.00
Salt	0.25	0.25	0.25	0.25
Vit-Mineral Premix*	0.25	0.25	0.25	0.25

*Supply per kg feed: Vit. A, 1500 IU; Vit. E; 11.0 mg; Riboflavin, 9.0 mg; Biotin, 0.25 mg; panthothenic acid, 11.0 mg, Vit. K, 3.0 mg, B12, 8.0 mg, Fe, 5.0 mg, Mn, 10.0 mg, Nicotinic acid, 8.0 mg, Zn., 4.5 mg, Co., 0.2 mg, Se., 0.01 mg

Table 2: Chemical composition of the experimental diets (%)

Nutrients	Diet Groups			
	D 1	D 2	D 3	D 4
Dry matter	87.00	89.50	89.00	89.00
Ash	10.65	9.75	10.00	10.83
Crude Fibre (CF)	10.93	10.25	11.10	9.45
Ether Extract (EE)	3.65	3.47	3.70	2.98
Crude Protein (CP)	12.12	14.18	16.09	16.02
Nitrogen Free Extract (NFE)	49.65	48.55	48.11	49.72
Cal. Values				
Crude protein (%)	12.11	14.00	16.00	16.00
Gross energy (kcal/kg)	2639.34	2651.61	2635.34	2642.49

increasing levels of CP supplemented with forage (*T. procumbens*) in the diet resulted to increase in the average daily weight gains of 15.63, 16.66 and 17.80 g for diets 1, 2 and 3 respectively while in Diet 4 which was not supplemented with forage, the average daily weight gain decreased to 14.25 g.

The cost of producing rabbits on Diet 4 proved to be the highest (273.97 Naira) with the least gains and profit margins of 48.13 naira and 17.56% respectively. The experiment showed that it cost least to produce rabbits on Diet 2 (221.69 Naira) with the highest gains and profit margins (350.56 Naira; 58.12%).

DISCUSSION

Results of this study indicate that, though, rabbits on concentrate diet alone consumed the highest amount of feed, they recorded the least efficiency of feed utilization and body weight gains. This, therefore, suggests that absence of the forage in rabbit's diet tends to have a depressant effect on its ability to utilize feed and thus on its growth performance. This result appears to be in agreement with the observation by Taiwo *et al.* (2004) that higher weight gains and improved feed utilization efficiency were obtained in rabbits fed on diet formulated to include *Tridax procumbens* than diet based solely on

Table 3: Performance of rabbits fed varying levels of crude protein with and without forage supplementation

Performance characteristics	Diet groups			
	D 1	D 2	D 3	D 4
Initial body weight (g)	552.13 ^a ±1.75	552.89 ^a ±0.780	551.92 ^a ±0.560	551.82 ^a ±0.280
Avg. daily feed intake (g)	94.10 ^a ±0.034	85.21 ^a ±0.006	96.53 ^a ±0.280	109.00 ^a ±0.016
Avg daily wt gain	15.63 ^a ±0.140	16.66 ^a ±2.72	17.80 ^a ±1.850	14.25 ^a ±0.548
FCR (g feed/g gain)	6.01 ^c ±0.053	5.11 ^b ±0.016	5.43 ^b ±0.008	7.66 ^b ±0.302
Final weight (g)	1209.66 ^a ±5.98	1252.00 ^a ±1.15	1300.00 ^a ±1.56	1550.00 ^a ±2.50

^{a,b,c,d}Means within the same row but bearing different superscripts are significantly (p<0.05) different

Table 4: Cost/benefit analysis of rabbits fed varying levels of CP with and without forage supplementation

Costs/Prices	Diet groups			
	D 1	D 2	D 3	D 4
Cost of production/rabbit (Naira)	218.58 ^a ±0.043	221.69 ^a ±0.020	251.89 ^b ±3.11	273.97 ^b ±0.026
Market value/rabbit (Naira)	355.37 ^a ±16.65	350.56 ^{ab} ±0.320	364.00 ^a ±0.32	322.11 ^b ±7.00
Gain (Naira)	120.12 ^{ab} ±1.59	128.86 ^a ±0.320	109.11 ^b ±0.20	48.13 ^c ±6.98
Profit margin (%)	54.95 ^a ±0.72	58.12 ^a ±0.140	44.70 ^b ±1.90	17.56 ^c ±1.35

^{a,b,c,d}Means within the same row but bearing different superscripts are significantly (p<0.05) different.

Basis of costing: cost of purchasing one kitten = 100.00 Naira; Market value of rabbit meat = 400 Naira/kg

concentrates. This improved feed conversion efficiency and higher weight gain obtained in rabbits fed concentrates supplemented with forage could have resulted from the ability of the rabbit to ferment the forage in their enlarged appendix and thus release the nutrients from the crude fibre. Consequently, it has been observed that rabbit is capable of utilizing up to 75% of the proteins in the forage plants (Cheeke, 1974).

The results of the study further indicated that supplementation of concentrate with forage in the diet of rabbits is cost effective. Rabbits fed concentrate feed supplemented with forage as in the case of Diet 2 manifested the highest efficiency of feed utilization, least production cost per kg of meat, highest saving and profit margin. Though the rabbits fed Diet 3 (16% +Tridax) had the heaviest final weight, it had significantly (p>0.05) higher production costs, lower savings and profit margins when compared with the rabbits fed diet 2. It is not economically feasible to produce rabbits on diets containing 16% CP with or without forage supplementation. Aduku and Olukosi (1990), observed that rabbit production was cost effective when the maize in the diet was partially substituted with sweet potato. However, Ngodigha and Okejim (1999) reported that the partial replacement for maize with sweet potato in rabbit diet was not found to be cost effective.

The relative economic gain of 128.86 Naira (58.12% profit margin) per rabbit due to supplementation of concentrate with Tridax is a very high saving which is capable of dictating the success of any rabbit producer. This level of profit margin is likely to result to increased production level thereby making more rabbit meat more available and more affordable which is capable of bridging animal protein deficiency gap common in the so-called developing countries especially, Nigeria.

Conclusion: This study was conducted to determine the growth performance and cost benefits of feeding weaner rabbits on diets with varying levels of crude protein supplemented with *Tridax procumbens* with view to making rabbit production economical, profitable and sustaining. Based on the results so far obtained, it can be concluded that Diet 2 (14% CP + forage) resulted to the highest economic returns and it is hereby recommended that a concentrate diet containing 14% CP and supplemented with *Tridax procumbens* is adequate to promote high feed utilization efficiency, optimum weight gain, least cost of production, high savings and profit margins.

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