Utilization of Agro-Industrial Wastes on The Growth Performance, Carcass Characteristics and Blood Profiles of Growing Rabbits

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Abstract: **The growth and haematological response of growing rabbits to diets containing graded levels of agro-industrial waste were studied. A 54 days feeding trial was conducted to evaluate the performance and response of growing rabbits to diets containing different agro industrial by-products. A total of 24 weaner rabbits were used for this study. Four experimental diets were formulated and designated as D1, D2, D3, and D4. D1 (control diet) contained 20% rice offal as its main fibre source while D2, D3 and D4 contained 20 % each of Burukutu waste, Cassava peel meal and Maize offal respectively as their main fibre source. The rabbits were randomly allocated to four experimental treatments of six rabbits per treatment while each treatment was replicated three times with two (2) rabbits per hutch in a completely randomized design. The result of growth performance revealed that average weight gain and feed conversion ratio were significantly (P<0.05) influenced by the dietary treatments. Rabbits fed 20% BKT had superior weight gain compare with those fed other diets. Average feed intake was however not influenced (P>0.05) by the dietary treatments. There were significant (P<0.05) differences in the carcass parameters measured except the weight of chest, thigh, hindleg and foreleg. Rabbits fed 20% MO diet had lowest values in all the parameters measured. Organs weight were not significantly (P>0.05) different across the treatment groups except in intestinal weight. Also, there were significant (P<0.05) differences in all the haematological parameters measured except in the values of haemoglobin. The experiment concluded that 20% BKT can be included in the diet of grower rabbits without adverse effect on growth performance of rabbits.**

Keywords**: growing rabbits, burukutu waste, maize offal, rice offal, haemoglobin**

I. INTRODUCTION

Agricultural wastes are defined as the residues from the growing and processing of raw agricultural products such as fruits, vegetables, meat, poultry, dairy products, and crops. The profitability of livestock farms in Nigeria depends to a great extent on the cost of feeding animals, which is often the principal production cost. The Nigeria agro-industry generates several byproducts that can be used to feed livestock. In some cases, these by-products are already being used in animal feed.

The rabbit (*Oryctolagus cunniculus*) is a non- ruminant herbivore which utilizes much undigested, unabsorbed feed materials, primarily cellulose, as a source of nutrients for maintenance and production. They are known to have the ability to thrive on non-conventional feedstuffs and forages which cannot be consumed directly by man. Although rabbits can survive on all forage diets, optimum performance can only be ensured in a mixed feeding regime involving forage and formulated feeds (Arijeniwa *et al.,* 2000).

Feed accounts for about 70% of the total cost of rabbit production (Akinmutimi and Ezea, 2006). This high cost has been attributed to competition among man, industry and livestock for conventional feedstuffs (Akinmutimi, 2004). There is therefore the need to source for alternative livestock feedstuffs that are cheap, readily available and not competed for by man and industry. The attempt to source for locally available low cost but nutritionally adequate feed stuffs for rabbit

There have been wide variations in responses of rabbits to the use of Agro industrial byproducts in poultry diets. These were attributed to differences in quality, varieties, storage periods, climatic conditions to mention but a few. However, there are several literature reports on the inclusion levels of these unconventional, agro by-products in rabbit diets without adverse effect on performance in Nigeria (Orunmuyi *et al.*,2006; Adeyemi *et al.*,2014; Makinde, 2016).

The profitability of rabbit production as an enterprise depends on the number of rabbits kindled per doe per year and the postnatal survival of the kittens.

Feed constitute the dominant input in animal production ranging from 65 - 75 % of the total cost of production. Similarly, feed ingredient account for over 90 % of compound feed industry (Esonu *et al.*, 2006).

Locally processed brewers dried grain (Burukutu waste) was reported to contain 93% dry matter, 22.39% crude protein, 19.1% crude fibre, 4 %ash, 48.6% nitrogen free extract, gross energy of 2280kcal per kg, 6.2% ether extact (Obidimma, 2009). It was also reported to contain very high fibre which made it very difficult for monogastrics such as poultry to utilize effectively at high levels in their diets (Makinde *et al*., 2013).

II. RESEARCH METHODOLOGY

A. Study Area

Experimental Site This study was conducted at the college farm. The poultry building is an open sided type that permits adequate ventilation in the house, with a concrete floor and zinc-roofing sheet.

B. Sources of Experimental Materials

Burukutu waste, cassava peel meal, rice offal and maize offal which was purchased around Neighboring market within the study area

C. Management of Experimental Animals

The experimental rabbits used were sourced from Lokoja market in Lokoja L G A and also from other rabbit farms in Kogi State. The rabbit hutch and house were thoroughly cleaned and disinfected two (2) weeks before the arrival of the rabbits. They rabbits were de-wormed with pirazine (containing piperazine citrate as its active ingredient) during their first three (3) days and later given vitamins. Between the fourth (4^{th}) and fifth (5^{th}) week of the study when mange was observed on the rabbits, Ivermectin injection was administered subcutaneously, following manufacturers instruction. Daily observation of the rabbits was done; feeders, drinkers, hutches and the entire building were cleaned daily to avoid disease build up. Feed and water were given *ad libitum* daily.

D. Experimental procedures

The study commenced February, 2022. The rabbits were fed the experimental diets one week before the commencement of measurement of the parameters. A total of twenty four growing rabbits of mixed breed were used for this research. The experiment lasted for a period of ten weeks. Each rabbit was housed in a cell measuring 45cm by 45cm by 40cm (L X B X H). The rabbits were randomly assigned to the cells in a manner that the initial average weight of the rabbits was about the same for all the treatments.

E. Experimental Diet

Four experimental diets was be formulated and designated as D1, D2, D3, and D4. D1 (control diet) contained 20% rice offal (RO) as its main fibre source while D2, D3 and D4 contained 20 % each of Burukutu waste (BKT), Cassava peel meal (CPM) and Maize offal (MO) respectively as their main fibre source.

F. Data Collection

1. Growth Performance Study

Rabbits were weighed individually at the beginning of the experiment and weekly thereafter for the duration of the experiment using weighing scale. Weighing was done before the morning feeding. The parameters determined for the evaluation of growth performance were initial weight (g), average feed intake (g), average weight gain (g) and feed conversion ratio. Weight gain for each animal was calculated by subtracting the initial weight

(g) from the final weight (g), while the feed conversion ratio was calculated by dividing the average feed intake (g) by the average weight gain (g).

2. Blood Collection

At the end of the study period, 5ml of blood was collected from three rabbits per treatment by severing the jugular vein and put into bottles containing Ethylene Diaminetetra- acetic Acid (EDTA) to determine the packed cell volume (PVC), red blood cell (RBC), haemoglobin (Hb), and white blood cell (WBC). Blood sample meant for serum biochemical studies were collected into plane bottles (without Anti- coagulant) to enhance serum separation. The blood serum obtained was used to determine total protein (TP), Albumin, Globulin, Glucose and Urea.

3. Carcass and Organs Weight Determination

At the end of the feeding trial, three rabbits per treatment were selected for carcass evaluation. The rabbits were fasted overnight but allowed access to water so as to empty the gut and allow excretion of the undigested feed residue. They were weighed, slaughtered, defurred using flame (singering) and then eviscerated. Individual internal organ (heart, liver, kidneys, lungs, viscera and spleen) were weighed and expressed as percentage of the live weight. The dressed carcass was weighed and dressing percentage was calculated as a percentage of the live weight using the formula.

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

4. Statistical Analysis

All data obtained were subjected to One Way Analysis of Variance (ANOVA) using SAS software (SAS, 2008) while significant means were separated with Duncan multiple range test at 5% level of significance.

III. RESULTS AND DISCUSSION OF FINDINGS

A. Growth Performance

Table 1 shows the result of the growth performance of growing rabbits fed diets containing different agro industrial by-products. There were significant ($P<0.05$) differences in the daily weight gain and feed conversion ratio of the rabbits. Daily weight gains of rabbits fed 20% BKT was higher ($P<0.05$) than those fed other diets. The lowest daily weight gain was recorded among rabbits fed 20% MO diets. Rabbits fed 20% BKT had better feed conversion ratio ($P<0.05$) than those fed other diets. There was no significant ($P>0.05$) difference in the daily feed intake of rabbits. In this present study, the average daily weight gains and feed conversion

ratio of rabbits fed 20% BKT diet was better than those fed other diets. Theses show that BKT diet inclusion in the feed is suggested.

Table 1: Growth Performance of growing rabbits fed diets containing different agro industrial by-products Treatments

Parameters	D1	D2	D3	D4	SEM	
Initial body weight (g)	826.02	825.71	825.98	824.77	0.73	
Final body weight (g)	1708.73[b]	1950.02[a]	1553.09[b]	1343.60 [b]	122.09	
Total weight gain (g)	882.71 [b]	1124.31 [a]	727.11 [b]	518.83 [b]	122.08	
Daily weight gain (g)	16.34[b]	20.82 [a]	13.47 [b]	9.61 [b]	2.47	
Total feed consumption (g)	3232.90	3276.61	3457.11	3381.70	90.94	
Daily feed intake, g	59.87	60.68	64.02	62.62	1.79	
Feed conversion ratio	5.62 [b]	4.04 [a]	5.68 [b]	6.99 [c]	0.84	

abc = mean with different superscripts within the same row are significantly (P<0.05) different. SEM=standard error of mean.

B. Carcass Characteristics

Table 2 shows the result of the Carcass characteristics and Organs weight of growing rabbits fed diets containing different agro industrial by-products. There were significant (P<0.05) differences in the parameters measured except the weight of chest, thigh, hindleg and foreleg.

Rabbits fed 20% MO diet had lowest values in all the parameters measured. Organs weight were not significantly (P>0.05) different across the treatment groups except in intestinal weight. BKT diet gave higher values (P<0.05) in most of the parameters measured. Agunbiade *et al*., 1999 reported high carcass characteristics of rabbits fed with relatively high fibre sources such as cassava peels and cassava leaf meal.

Table 2: Carcass characteristics of growing rabbits fed diets containing different agro industrial by-products Treatments

Parameters	D1	D2	D3	D4	**SEM**	
Live weight (g)	1450.00[b]	1733.33[a]	1325.98[bc]	1226.67[c]	128.67	
Slaughter weight, g	1400.00[a]	1648.34[a]	1235.00[ab]	1107.01[b]	135.33	
Dressed weight, g	1010.00 [a]	1381.67 [a]	958.07 [b]	856.60 [b]	131.27	
Dressing percentage,%	69.66 [b]	79.71 [a]	72.25 [b]	69.83 [b]	2.51	
Chest,%	14.94	15.49	14.98	12.00	1.80	
Thigh, %	7.57	7.64	6.51	5.79	0.93	
Loin, %	18.75 [a]	20.62 [a]	20.63 [a]	13.05 [b]	1.89	
Hindleg, %	3.81	6.24	5.19	2.90	0.84	
Organs weight						
Lungs, %	0.54	0.63	0.50	0.40	0.12	
Kidney, %	0.62	0.71	0.66	0.52	0.11	
Liver, %	2.17	2.55	2.31	1.54	0.52	
Spleen, %	0.03	0.04	0.04	0.02	0.01	
Heart, %	0.23	0.28	0.23	0.16	0.07	
Intestine weight, %	16.26 [a]	18.75 [a]	17.26 [a]	11.58 [b]	1.79	

abc = mean with different superscripts within the same row are significantly (P<0.05) different.
SEM=standard error of mean.

C. Blood Profiles

Table 3 shows the result of the Haematological parameters and serum biochemical indices of growing rabbits fed diets containing different agro industrial by-products. There were significant (P<0.05) differences in the parameters measured except in the values of haemoglobin. Glucose and Urea were the only serum biochemical indices that were significantly different (P<0.05) among the serum parameters measured across the treatment groups.

According to Togun *et al.* (2007), when the haematological values fall within the normal range reported for rabbit, it is an indication that the diets did not show any adverse effects on haematological parameters during the experimental period. Haematological parameters are good indicators of the physiological status of animals (Adenkola and Durotoye, 2004).

Table3: Haematological parameters and serum biochemical indices of growing rabbits fed diets containing different agro industrial by-products Treatments

Parameters	D1	D2	D3	D4	SEM	
Packed cell volume (%)	29.60^{b}	28.17^{b}	37.26^{a}	27.05^{b}	2.53	
Haemoglobin (g/dl)	9.20	8.70	12.78	7.96	1.85	
White blood cell $X10^{6}$	75.10^{c}	85.81^{b}	97.90^{a}	82.29^{b}	5.71	
Red blood cell $X\ 10^{9}$	15.63^{a}	11.87^{b}	13.89^{ab}	12.05^{b}	1.95	
Serum Biochemistry						
Albumin, g/dl	2.22	2.17	2.25	2.15	0.07	
Glucose, g/dl	96.15^{a}	113.29^{a}	98.94^{a}	91.81^{b}	2.80	
Total protein, g/dl	5.11	6.53	5.75	5.09	0.75	
Globulin, g/dl	1.89	3.76	2.45	2.73	0.80	
Urea, g/dl	32.28^{b}	45.16^{a}	35.94^{b}	37.94^{a}	2.90	

abc = mean with different superscripts within the same row are significantly (P<0.05) different. SEM=standard error of mean.

IV. CONCLUSION

Based on the result of this study, it can be concluded that out of the four fibre sources studied, burukutu waste gave the best result in terms of the growth performance, carcass yield and blood profiles of growing rabbits.

V. RECOMMENDATIONS

Based on the result of this study, it is recommended that 20% burukutu waste can be included in the diet of growing rabbits without adverse effect on growth performance, carcass yield and blood profiles of growing rabbits.

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