Evaluation of Growth Indices, Nutrients Digestibility and Economic Implication of Rabbits Fed Millet Offal-Based Diets

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Introduction

In the developing countries (Nigeria inclusive), animal protein intake is dismally low. This is mainly attributed to the high cost of intensive animal/livestock production of which feed cost alone accounts for over 60% of the total cost of monogastric animal production (Agbede *et al.*, 2008; Ogunsipe *et al.*, 2011).

Maize, a cereal crop has remained the chief energy source in livestock feed, representing over 50% of the total feed ingredients in formulated ration. The various uses to which maize is put has placed additional cost constraints in its continuous use in livestock feed formulation. Thus, there is urgent need ever than before to source for novel/alternative ingredients that can adequately replace maize without compromising the diets nutrient status for good growth and wellbeing of the animals.

Millet offal; a waste millet/grain factory has been adjudged to contain appreciable quantity of nutrient with 14.60-20.65% crude protein (CP), 10-12% crude fat (CF), 2148.00-2506.00 kcal/kg metabolizable energy (Ezieshi and Olomu, 2008). This nutrient rich product is often discarded by the factory as waste of no economic value. This study was aimed to assess the nutritional value of millet offal on the growth performance, nutrients digestibility and economic effect on rabbit production.

Materials and Methods

The millet offal used for the study was collected free from a processing factory within Ondo town, void of extraneous materials, sun-dried and thereafter milled before incorporated with other feed ingredients. Fifty (50) rabbits of cross breeds aged 6-7 weeks with mean weight (710-810g) were randomly assigned to five dietary treatments at 0 (control), 25, 50, 75 and 100% inclusion levels for diets 1, 2, 3, 4 and 5, respectively in a completely randomized design experiment that lasted for 56 days. Prior to the experiment, the rabbits were given one week adaptation phase, during which they were fed on commercial growers mash (Guinea feed, containing 160 gkg^{-1} crude protein and 2900 kcal kg^{-1} ME). At the end of the adaptation period, the rabbits were fed their respective experimental diets, during which records were taken on daily feed consumption and weekly weight changes. Feed consumption and faeces voided of 5 days towards the end of the feeding trial were collected, dried at 55^0C in an air circulating oven for 72h and thereafter analyzed for the nutrients digestibility determination (AOAC, 1990).

On the 56th day of the trial, seven rabbits were fasted overnight but with ad libitum supply of water. Before slaughtering, blood was collected from 3 rabbits selected randomly among the 7 fasted rabbits, using sterile lancets. Blood sample with ethylene diamine tetra acetic acid (EDTA), as an anticoagulant were used for determining the packed cell volume (PCV), red blood cell (RBC) counts, white blood cell (WBC) counts and haemoglobin concentration (Hb) (Coles, 1986). The decant serum from the bottle without EDTA was used for the various serum biochemical constituents (WHO, 1980). The remaining 4 rabbits to a treatment group were weighed, slaughtered and skinned for carcass evaluation and organ weights assessment.

The cost of feed ingredients vis-à-vis the cost of each diet was calculated based on the prevailing market price at the time of the study. All data generated on the growth indices, haematological variables, serum metabolites and nutrients digestibility were subjected to analysis of variance (ANOVA) of SPSS 15 (2006) package, and the separated means were compared using Duncan multiple range test of the same software.

Results and Discussion

The results on Table 1 shows that the final body weight (FBW): 1.72-1.81kg, total weight gain (TWG): 0.99-1.04kg, average daily weight gain (ADWG):17.69-18.53g and feed conversion ratio (FCR): 3.26-3.99 of rabbits on the control diet were not significantly ($p>0.05$) different from those fed the various test diets. However, the total feed consumed (TFC) and average daily feed consumed (ADFC) of the rabbits were significantly ($p<0.05$) affected with rabbits fed on the control diet having the highest value (71.70g/d) and rabbits on 75% millet offal-based diet having the least value (59.09g/d). The FCR of rabbits on 25-100% millet offal inclusion had an improvement of 10.5, 12.5, 17.5 and 18.3% over those fed the control group, respectively. The apparent digestibility results showed that millet offal could be tolerated up to 100% inclusion level (representing 47.46g/100g in the gross feed composition) to growing rabbits, as this level led to decrease in the feed cost/kg weight gain and improved relative cost benefit of ₦121.55 and 52.26%, respectively, and a cost differential of ₦133.04 over the control group (Table 1). This suggests that millet offal has similar nutrient density or even surpassed the conventional maize grains. This agrees with the recent report by Ogunsipe and Agbede (2012) that rabbits can tolerate up to 100% millet offal in place of maize grains, Ogunsipe *et al*. (2011) that the use of glyricidia leaf protein concentrate in rabbits diet resulted to improved savings and reduced cost.

On haematological variables, the WBC, MCH and MCV were significantly ($p<0.05$) influenced at 50-100% millet offal-based diets while the PCV, RBC, MCHC and Hb were not significantly ($p>0.05$) affected by the test diets (Table 2). The values reported for the blood parameters and serum biochemical indices in this study were within the normal physiological range for healthy rabbits (RAR, 2007).

Conclusion and Outlook

From the foregoing, rabbits could tolerate up to 100% millet offal in place of maize grains in rabbit's concentrate diet with decreased production cost without compromising growth performance and wellbeing of the animal.

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Table 1: Performance characteristics and cost implications of growing rabbits fed millet offal-based diets.

	Levels of inclusion (%)					
Parameters	0(Diet 1)	25(Diet 2)	50(Diet 3)	75(Diet 4)	100(Diet 5)	SEM
Initial body weight g	810.00	750.00	810.00	710.00	720.00	38.59 [NS]
Final live weight g	1814.50	1787.68	1800.50	1725.00	1723.10	52.74 [NS]
Total weight gain/rabbit/g	1004.50	1037.68	990.50	1015.00	1003.10	26.39 [NS]
Average weight gain/rabbit/day/g	17.94	18.53	17.69	18.13	17.91	0.69 [NS]
Total feed consumed g	4015.35[a]	3701.91[ab]	3460.68[b]	3308.89[b]	3702.08[ab]	74.23*
Average feed consumed/rabbit/day/g	71.70[a]	66.11[ab]	61.80[b]	59.09[b]	66.11[ab]	5.82*
Feed conversion ratio	3.99	3.57	3.49	3.29	3.26	0.24 [NS]
Feed cost ₦/kg	63.33	55.68	48.23	40.52	32.85	
Feed cost ₦/kg weight gain	254.59	198.09	168.56	131.49	121.55	
Cost differential	-	56.50	86.03	123.10	133.04	
Relative cost benefit (%)	-	22.19	33.79	48.35	52.26	

[ab] means in the same row with different superscripts differ significantly (P<0.05)

Table 2: Haematology and serum metabolites of growing rabbits fed millet offal-based diets

	Levels of inclusion (%)					
Haematological indices	0(Diet 1)	25(Diet 2)	50(Diet 3)	75(Diet 4)	100(Diet 5)	SEM
PCV (%)	38.70	36.50	39.50	37.30	38.06	2.48^{NS}
RBC (10^9/ml)	5.98	6.12	6.24	5.89	6.18	0.86^{NS}
WBC (10^9/ml)	5.96^{b}	6.57^{b}	7.36^{a}	7.39^{a}	7.42^{a}	0.73*
MCH (pg)	19.36^{b}	20.00^{b}	25.61^{a}	21.10^{b}	26.23^{a}	2.59*
MCHC (%)	30.40	30.60	30.55	31.00	30.70	1.16^{NS}
MCV (fl)	55.28^{b}	54.71^{b}	55.39^{b}	68.34^{a}	66.93^{a}	5.17*
Hb (g/dL)	11.38	11.56	11.62	11.68	11.69	1.36^{NS}
Serum metabolites						
Albumin (g/dL)	2.85	2.81	3.05	3.10	2.98	0.21^{NS}
Globulin (g/dL)	1.83	2.02	1.85	1.88	2.00	0.14^{NS}
Albumin/Globulin ratio	1.53	1.38	1.62	1.63	1.50	0.12^{NS}
Total serum protein (g/dL)	7.48^{c}	7.25^{c}	7.93^{b}	8.13^{a}	8.07^{ab}	0.37*
Blood glucose (mol/L)	9.83^{ab}	9.58^{b}	9.71^{ab}	10.53^{a}	9.92^{ab}	0.25*
Cholesterol (mol/L)	4.25^{a}	4.18^{a}	3.62^{b}	3.58^{b}	3.51^{b}	0.18*
Urea (mol/L)	10.14^{c}	10.33^{b}	10.72^{a}	10.83^{a}	10.59^{ab}	0.54*

^{abc}means in the same row with different superscripts differ significantly ($P<0.05$)