

EFFECT OF RUMEN-FILTRATE FERMENTED RICE HUSK ON GROWTH PERFORMANCE AND NUTRIENT DIGESTIBILITY OF BROILER CHICKENS

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ABSTRACT

The study was conducted to evaluate the effect of Rumen-filtrate fermented rice husk on growth performance of broiler chickens. A total of 150 Day-old chicks were used for the research. Rumen filtrate treated rice husk Meals was included at 0, 5, 10, 15 and 20% to form diets T 1, T 2, T 3, T 4, and T 5. The experimental design used was Completely Randomized Design (CRD). The chickens were randomly allocated to five treatments having three replicates each with ten birds per replicate. Clean water and feed were provided *ad libitum*. Experimental birds were managed under a deep litter system. Nutrient digestibility trial was conducted at eight week. Data on feed intake, body weight, weight gain and feed conversion were collected and analysed using One Way Analysis of Variance. The results showed no significant ($P>0.05$) differences in live weight, feed intake, feed conversion ratio and mortality. However, the growth rate was influenced ($P<0.05$) by the dietary treatments (T1 13.87, T2 11.76, T3 14.50, T4 14.68, T5 14.80). Apparent digestibility results showed that dry matter, crude protein, crude fibre and ether extract digestibility were influenced ($P<0.05$) by dietary treatments. The results obtained from this study indicated that dietary inclusion of fermented rice husk meal supported a superior performance of chicks and can be included in broiler's diets up to 20% without detrimental effects.

Key words: rumen filtrate, broiler, fermentation, performance, digestibility

INTRODUCTION

The developing countries pursuit in advocating the production of rapid growing animals like poultry comes up as a result of rising demand for food (Obinne and Okorie, 2008). This is ascribed to the growth in population. **Nigeria in particular, poultry supplies up to 15 % of the entire total annual** protein consumption with an estimated 1.3kg of poultry stuffs consumed per head per annum (Adeyemi *et al.*, 2008). High increase in price of poultry products made it difficult for an average Nigerian to consume chicken meat or its products meant for standard nutrition requirement. It is expected that other feed products should be available, cheap, and have a comparative nutritional value when compared to conventional feed ingredients (Adeyemi *et al.*, 2008). Rice husk fermentation using rumen filtrate as inoculum increase crude protein and decrease the crude fiber content (Wizna *et al.*, 2008). The bacteria in the rumen filtrate act on the fiber part of the husk through cellulase enzyme and act on the phytate-phosphorus by its content of phytase enzyme which lowers fiber content and makes the organic phosphorus available to the chickens. This experiment was conducted to determine the effect of rumen filtrate fermented rice husk\ diets on growth performance of broiler chickens.

MATERIALS AND METHODS

Sources of Experimental Birds and Feed Ingredients

One hundred and fifty day-old broilers were purchased from Chi farms, Ibadan. Rice husk, feed ingredients and micro nutrients were purchased at Veterinary Shop, Minna. Ruminal fluid was collected from rumen compartment of slaughtered cattle in sterile collection bottles at the Minna Modern Abattoir. The fluid was filtered through a muslin cloth. Solid material was discarded while the fluid content was transferred to clean bottle for laboratory culturing at Microbiology laboratory Bosso Campus Minna.

Experimental diets, animals and their management

Five experimental diets were formulated and designated as T1, T2, T3, T4 and T5 representing different levels of inclusion at 0, 5, 10, 15 and 20%. The formulated diets consisted of maize, groundnut cake, fermented rice husk, fish meal, lysine, methionine, bone meal, salt, palm oil and vitamins/minerals premix to give 23% crude protein and metabolizable energy of 3000 ME (Kcal/kg). One hundred and fifty day-old

broiler chicks were subjected to 56 days of experimental period. On arrival, birds were weighed and randomly allocated to five treatments with three replicates of ten chicks in a Completely Randomized Design (CRD). Routine vaccinations were provided. Feed and water were provided *ad libitum*.

Table 1: Composition of Experimental Diets for starter and finisher phase

Ingredients (%)	Dietary levels of fermented rice husk meal				
	0%	5%	10%	15%	20%
	Diet 1	Diet 2	Diet 3	Diet 4	Diet 5
Maize	62.18	59.07	55.96	52.85	49.74
Rice husk	0.00	3.11	6.22	9.33	12.44
Groundnut cake	28.82	28.82	28.82	28.82	28.82
Fish meal	4.00	4.00	4.00	4.00	4.00
Palm oil	1.00	1.00	1.00	1.00	1.00
Limestone	1.00	1.00	1.00	1.00	1.00
Bone meal	2.00	2.00	2.00	2.00	2.00
Salt	0.25	0.25	0.25	0.25	0.25
Premix*	0.25	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25
Total	100	100	100	100	100
Chemical composition					
Crude protein	21.08	21.17	21.27	21.36	21.45
Crude fiber	2.83	2.84	2.87	2.89	2.90
Ether extract	6.43	6.47	6.53	6.57	6.63
Methionine	0.34	0.33	0.33	0.33	0.32
Lysine	0.84	0.84	0.84	0.83	0.83
Calcium	1.35	1.36	1.36	1.37	1.37
Phosphorus	0.77	0.78	0.78	0.79	0.79
ME(Kcal/kg)	3059.75	2996.95	2931.24	2865.52	3062.67

*Biomix premix supplied the following per kg diet: Vit. A, 10000 I.U; vit. D, 2000 I.I; Vit. E, 25 mg; Vit. K, 2 mg; Thiamine B1, 1.8 mg; Riboflavin B2, 5 mg; Pyridoxine B6, 3.5 mg; Niacin, 28 mg; Vit. B12 0.015 mg; Pantothenic acid, 7.5 mg; Folic acid, 0.75 mg; Biotin, 0.06 mg; choline chloride, 300 mg; Manganese, 40 mg; Zinc, 30 mg; Antioxidant 1.25mg Iron, 20 mg; Copper, 3 mg; Iodine, 1 mg; Selenium, 0.2 mg; Cobalt, 0.2 mg

Data Collection and nutrient digestibility

The following parameters were measured from daily and weekly feeding trials: Feed intake, Body weight, Weight gain, Feed conversion ratio and digestibility. At the end of 56th day of the feeding trial, two birds were randomly selected per replicate and housed in metabolic cages for digestibility trial. Chickens were fed *ad libitum* for three days to get acclimatized. Feeds were given to birds on equal quantity. Droppings were collected separately for each treatment at fifth day as adopted by Ayanwale and Aya (2006).

Statistical Analysis

Data generated during the study on various parameters were subjected to analysis of variance using the (SAS, 2000) package. Where statistical difference occurred, ($P < 0.05$) means were separated using Duncan's Multiple Range Test.

RESULTS AND DISCUSSION

Table 2 shows the proximate composition of the unfermented and fermented rice husk meal. Fermentation led to a slight increase in the dry matter (91.37-93.48 %), crude protein (6.04-8.87 %), ether extract (2.21-5.00 %) and nitrogen free extract (27.10-43.74). Fermentation however led to a decrease in crude fibre (42.12-29.33) and ash (13.90-6.54) of the rice husk meal. The proximate composition showed that

fermentation improved the nutrient content. This is in line with the study of Akinwolere and Tsado (2014) who reported that rumen filtrate of rice husk meal increased dry matter, crude protein and reduced ash. Reason, fermentation tends to degrade the crude fibre making it a better alternative for broilers.

Table 2: Proximate composition of unfermented, fermented rice husk and their percentage change

Parameters	Unfermented rice husk	Fermented rice husk	% change
Dry matter (%)	91.37	93.48	2.26
Crude protein (%)	6.04	8.87	31.91
Ether extract (%)	2.21	5.00	55.80
Ash (%)	13.90	6.54	-52.90
Crude fibre (%)	42.12	29.33	-30.36
Nitrogen free extract (%)	27.10	43.74	38.04
Moisture	8.63	6.52	-24.48
Metabolisable Energy Kcal/Kg	1366.31	2289.96	40.33

($37 * CP + 81.8 * EE + 35.5 * NFE$ Pazeng, G. 1984)

The proximate composition of five experimental diets fed to broiler chickens at the starter phase is presented in Table 4. The results showed that the dry matter, crude protein, crude fibre, ether extract, nitrogen free extract, ash and moisture contents ranged from 93.30 to 95.40, 22.75 to 23.63, 2.50 to 4.10, 9.00 to 12.10, 47.55 to 50.29, 7.70 to 9.90, 4.60 to 6.70 and the calculated amounts of energy provided was 3290.87 to 3545.46 Kcal/kg.

Table 3: Proximate compositions and calculated energy value of the experimental diets

Parameters	Dietary Treatments				
	Diet 1	Diet 2	Diet 3	Diet 4	Diet 5
Dry matter (%)	93.30	95.26	93.58	94.20	95.40
Crude protein (%)	23.45	22.97	23.25	23.63	22.75
Crude fiber (%)	2.50	3.20	3.70	3.90	4.10
Ether extract (%)	12.10	10.30	9.00	9.74	9.36
NFE (%)	47.55	50.29	47.73	48.58	49.64
Ash (%)	7.70	8.50	9.90	8.35	9.55
Moisture (%)	6.70	4.74	6.42	5.80	4.60
ME (kcal/kg)	3545.46	3477.73	3290.87	3395.63	3369.62
Calculated composition					
Crude protein (%)	21.08	21.17	21.27	21.36	21.45
Crude fiber (%)	2.83	2.84	2.87	2.89	2.90
Ether extract (%)	6.43	6.47	6.53	6.57	6.63
Methionine (%)	0.34	0.33	0.33	0.33	0.32
Lysine (%)	0.84	0.84	0.84	0.83	0.83
Calcium (%)	1.35	1.36	1.36	1.37	1.37
Phosphorus (%)	0.77	0.78	0.78	0.79	0.79
ME(Kcal/kg)	3059.75	2996.95	2931.24	2865.52	3062.67

Results of the effect of rumen-filtrate fermented rice husk on growth rate, live weight, feed intake, feed conversion ratio and mortality are presented in Table 4. Dietary treatments had effects ($p < 0.05$) on the growth rate only. Chickens on T₁, T₄ and T₅ had similar ($P > 0.05$) growth rate. Chickens on T₁, T₂ and T₃ had ($P > 0.05$) similar growth rate. While chickens on T₄ and T₅ had higher ($P < 0.05$) growth rate than those on T₂, and T₃. The significant influence ($P < 0.05$) on growth rate among the treatment groups agreed with Warren and Farrel (1990) who reported similar trend when chicken were fed at different inclusion levels of diets and 20% had the highest influence on them. Live weight, feed intake, feed conversion ratio and mortality which were not significantly ($P > 0.05$) influenced were in contrary to the research work of

Adeniji (2010) who used 15% inclusion level of fermented rice husk and recorded decreased in weight but increased in feed intake and feed conversion ratio.

Table 4: Effect of rumen filtrate fermented rice husk on growth (g), live weight (g), feed intake (g), feed conversion ratio and mortality of Broiler chicken at finisher phase

Parameter	T 1	T2	T3	T4	T5	SEM	LS
Growth rate	13.87 ^{ab}	11.76 ^b	14.50 ^b	14.68 ^a	14.80 ^a	17.143	**
Live weight	631.91	558.58	661.24	614.94	654.26	0.418	NS
DFI	45.62	48.73	53.11	50.98	60.13	2.012	NS
FCR	3.37	4.16	3.68	3.68	4.07	0.167	NS
Mortality	0.00	0.00	0.00	0.00	0.00	0.00	NS

a,b,c; Means denoted by different superscripts in the same row are significantly different ($P < 0.05$).

Key:**= Significant, NS=Not significant SEM=Standard error mean DFI=Daily Feed intake FCR=Feed conversion ratio

Table 5 shows the apparent nutrient digestibility of dry matter and nutrients in the diets containing varying levels of rumen-filtrate fermented rice husk (RFRH). The digestibility values for the dry matter, crude protein, crude fibre and nitrogen free extract were higher in Treatment 4 (15 %) than in 1, 2, 3 and 5 (0, 5, 10 and 20 %). General trend observed was that the RFRH diets increased the nutrient digestibility of all the parameters significantly ($P > 0.05$) except nitrogen free extract. The results obtained on the digestibility revealed that dietary treatment had significant ($P < 0.05$) influence on dry matter, crude protein, crude fibre and ether extract which also agrees with research work of Campos *et al.*, (1987) who observed the effect of adding fermented rice husk to a diet based on rice for fattening chickens and had significant ($P < 0.05$) influence in digestibility, crude protein, crude fibre and ether extract. However, nitrogen free extract not significantly ($P > 0.05$) influenced was contrary to the report of Akinwolere and Tsado (2014) who studied the apparent nutrient digestibility of rumen filtrate fermented shea nut meal on broilers and reported significant ($P < 0.05$) difference on all the apparent nutrient digestibility parameters.

Table 5: Effect of rumen filtrate fermented rice husk diets on nutrient digestibility

Parameters(%)	T ₁ 0%	T ₂ 5%	T ₃ 10%	T ₄ 15%	T ₅ 20%	SEM	LS
Dry Matter	91.00 ^{ab}	91.33 ^{ab}	92.33 ^a	92.67 ^a	89.33 ^b	0.443	**
Crude Protein	88.67 ^{ab}	88.67 ^{ab}	90.67 ^a	90.67 ^a	86.67 ^b	0.573	**
Crude Fibre	66.00 ^c	77.00 ^{ab}	80.33 ^{ab}	83.67 ^a	74.33 ^b	1.850	**
Ether Extract	90.33 ^a	91.67 ^a	93.67 ^a	93.00 ^a	84.33 ^b	0.985	**
NFE	96.33	96.00	95.67	96.67	95.67	0.182	NS

a,b,c; Means denoted by different superscripts in the same row are significantly different ($P < 0.05$).

Key:**. Significant NS=Not significant SEM=Standard error mean LS=Level of significance NFE=Nitrogen free extract

CONCLUSION AND RECOMMENDATION

The results of the study showed that 20% inclusion level of rumen filtrate fermented rice husk (RFFRH) gave better growth rate. The digestibility study showed that the dry matter, crude protein, crude fibre and ether extract were significantly influenced by dietary treatments. RFFRH meal can be included in the diets of broiler chickens up to 20% without detrimental effects on the birds. The use of rice husk as a non-conventional feed ingredient should be advocated in order to reduce its effect as an environmental pollutant or waste and create wealth in areas where rice husk is abundant. Further research work should be carried out on the use of rumen filtrate fermentation of rice husk meal in the diets of other categories of chicken.

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