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Response of Broiler Chickens to Graded Levels of Untreated and Urea Treated Rice Offal

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Abstract
A total of one hundred and fifty (150) day-old unsexed broiler chickens averaging 50.00 grammes were utilized for the purpose of accessing their response to graded levels of untreated and urea treated rice offal. These were randomly allocated into 5 equal groups of 30 birds in each treatment replicated 3 times with each replicate having 10 birds. Five (5) diets designated I (control), II, III, IV and V were formulated such that untreated rice offal was included at 7.5% and 15.0% (diets II and IV) while urea treated rice offal was included at 7.5% and 15.0% (diets III and V) respectively. The results show that there were no significant differences ($P>0.05$) in feed intake, weight gain and efficiency of feed utilization among birds fed the untreated and urea treated rice offal. However, feed intake was lower with birds fed 15.0% urea treated rice offal than those fed untreated rice offal. Weight gain was better with birds fed 15.0% urea treated rice offal. Birds fed 15.0% urea treated rice offal had better efficiency of feed utilization than those fed either 7.5% urea treated rice offal or 15.0% untreated rice offal. Finally, feed cost per unit weight gain significantly ($P<0.05$) improved with birds fed all the diets containing untreated and urea treated rice offal compared with those fed the control diet. However, there were no significant differences ($P>0.05$) in feed cost per unit weight gain among birds diets containing either untreated or urea treated rice offal; with birds fed the diet containing 15.0% urea treated rice offal supporting the best feed cost per unit weight gain. On the basis of the results obtained, it may be recommended that untreated or urea treated rice offal could be included at up to 15.0% of the diet of broiler chickens without any adverse effect on their performance.

Introduction

Nigeria has the potential to produce about 200,000 metric tonnes of rice offal from the 500,000 metric tonnes of rice produced annually (Wudiri, 1991). The offal, therefore, makes up about 40% of the parboiled rice and contains husk, bran polishing and small quantities of broken grains. In spite of its abundance, it has been neglected as animal feeds because it contains high level of fibre and low protein and energy (Oyawoye and Nelson, 1999).

Maikano (2007) reported the proximate composition of rice offal thus; 94.42% dry matter, 5.09% crude protein, 30.39% crude fibre, 3.40% ether extract, 16.67% ash and 46.10% nitrogen free-extract. Several workers (Dafwang and Shwarmen, 1996; (Abasiekong, 1997; Awesu *et al*., 2002) have reported that the high crude fibre (30 – 44%); mainly lignin and low protein contents have resulted in reduced voluntary feed intake and low utilization in poultry feeding. This high fibre concentration results in poor nutrient utilization and consequent poor growth performance due to the presence of non-starch-polysaccharides (NSP) and phytate when fed to broiler chickens without any form of treatment.

The use of rice offal to replace cereal grains in poultry diets have been studied (Dafwang and Damang, 1995; Carew *et al*., 2005) and has been successful fed to broiler chickens at lower levels of inclusion (Amaefule *et al.,* 2006; Onuh, 2006; Maikano, 2007; Yakubu *et al*., 2007) in order to reduce feed costs and increase the profit margin.

Higher levels of inclusion may therefore necessitate the development of strategies to increase the value of this by-product in order to reduce its fibre and increase protein contents. Alkali treatments of various fibrous materials (Faniyi and Ologhobo, 1999) and urea treatment (Isikwenu *et al.*, 2008; Onuh, 2011) have been reported to improve their nutritional qualities.

The study reported herein was conducted to determine the response of broiler chickens to graded levels of untreated and urea treated rice offal.

Materials and Methods

The study was conducted in the Poultry unit of the Department of Animal Husbandry, Akperan Orshi College of Agriculture, Yandev-Gboko, Benue State, Nigeria.

The rice offal, containing mainly the husk, used in the present study was collected from Rice Mill in Gboko, Benue State, Nigeria.

The urea treated rice offal was prepared according to the procedures outlined Isikwenu *et al*. (2008). It was then sun dried for 2 days. The proximate chemical composition of untreated and urea treated rice offal are presented in Table 1.

A total of one hundred and fifty (150) day-old unsexed broiler chickens obtained from CHI hatchery, Ibadan averaging 50.00 grammes were utilized for the purpose of the study. These were randomly allocated into 5 equal groups of 30 birds in each treatment and brooded after a two day initial stabilization period on deep litter system. Each treatment was replicated 3 times with each replicate having 10 birds.

Five (5) diets designated I, II, III, IV and V were formulated for broiler chickens such that untreated rice offal was included at 0, 7.5% and 15.0% of diets I, II and IV respectively and these were compared with urea treated rice offal included at 7.5% and 15.0% of diets III and V respectively. All diets were adequately fortified with vitamins and minerals. The compositions of the broiler starter diets are presented in Table 2 while those of finishing broiler diets are presented in Table 3.

Table 1. Proximate chemical composition of untreated and urea treated rice offal

Constituent	**[a]Untreated**	**[b]Treated**
Crude protein (%)	5.09	14.50
Crude fibre (%)	30.39	25.00
Ether extract (%)	3.40	7.37
Ash (%)	16.67	11.52

Sources: [a]Maikano (2007); [b]Yakubu *et al*. (2007).

Table 2: Composition of broiler starter experimental diets

Ingredient	**Dietary Treatments**				
	I Control	**II 7.5% UNRO**	**III 7.5% UTRO**	**IV 15% UNRO**	**IV 15% UTRO**
Maize	45.00	38.50	40.50	30.00	33.00
Full-fat Roasted Soyabean	51.00	50.00	48.00	51.00	48.00
Untreated Rice Offal	0.00	7.50	0.00	15.00	0.00
Urea Treated Rice Offal	0.00	0.00	7.50	0.00	15.00
Bone Meal	3.00	3.00	3.00	3.00	3.00
Mineral-Vitamin Premix[+]	0.25	0.25	0.25	0.25	0.25
DL-Methionine	0.25	0.25	0.25	0.25	0.25
L-Lysine HCl	0.25	0.25	0.25	0.25	0.25
Common Salt	0.25	0.25	0.25	0.25	0.25
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Calculated Analyses					
Crude Protein (%)	23.43	22.90	22.97	22.95	23.39
Metabolizable Energy (Kcal/kg)	3213	3034	2961	2853	2706
Crude Fibre (%)	3.71	6.68	5.33	9.73	7.05
Methionine (%)	0.67	0.66	0.64	0.66	0.62
Lysine (%)	1.79	1.77	1.69	1.80	1.67
Methionine + Cystine (%)	0.93	0.92	0.88	0.92	0.86
Feed cost/kg (₦/kg)	74.65	69.72	69.63	64.95	64.75

UNRO = Untreated Rice Offal; UTRO = Urea Treated Rice Offal

[+]*Vitamin-mineral premix provided the following vitamins and minerals per kg of diet: A 15,000 I.U; D3 3000 I.U; E 30 I.U; K 2.5mg, B , 2.0mg; B_2 6.0mg; B_6 4.0mg; Niacin 40mg; B_{12} 0.02mg; Pantothenic 10mg; Folic 1.0mg; Biotin 0.08mg; Choline Cl 500mg; Antioxidant 125mg; Mn 6mg; Zn 60mg; Fe 24mg; Cu 6mg; I 1.4mg; Se 0.24mg; Co 0.4mg. Product of Agricultural Technologies Nigeria Ltd. Marketed by S&D Farms Abeokuta.*

Table 3: Composition of finishing broiler experimental diets

Ingredient	Dietary Treatments				
	I Control	II 7.5% UNRO	III 7.5% UTRO	IV 15% UNRO	IV 15% UTRO
Maize	46.00	40.50	42.50	34.00	40.00
Full-fat Roasted Soyabean	38.00	48.00	34.00	35.00	29.00
Untreated Rice Offal	0.00	7.50	0.00	15.00	0.00
Urea Treated Rice Offal	0.00	0.00	7.50	0.00	15.00
Maize Offal	6.00	6.00	6.00	6.00	6.00
Palm Kernel Cake	6.00	6.00	6.00	6.00	6.00
Bone Meal	3.00	3.00	3.00	3.00	3.00
Mineral-Vitamin Premix[+]	0.25	0.25	0.25	0.25	0.25
DL-Methionine	0.25	0.25	0.25	0.25	0.25
L-Lysine HCl	0.25	0.25	0.25	0.25	0.25
Common Salt	0.25	0.25	0.25	0.25	0.25
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Calculated Analyses					
Crude Protein (%)	19.88	19.06	19.13	18.54	18.10
Metabolizable Energy (Kcal/kg)	3105	2928	2855	2749	2605
Crude Fibre (%)	4.82	7.76	6.41	6.96	6.05
Methionine (%)	0.61	0.60	0.58	0.59	0.54
Lysine (%)	1.47	1.43	1.35	1.41	1.21
Methionine + Cystine (%)	0.85	0.83	0.80	0.82	0.74
Feed cost/kg (₦/kg)	68.84	69.86	63.76	58.94	58.64

UNRO = Untreated Rice Offal; UTRO = Urea Treated Rice Offal

[+]*Vitamin-mineral premix provided the following vitamins and minerals per kg of diet: A 15,000 I.U; D3 3000 I.U; E 30 I.U; K 2.5mg, B , 2.0mg; B_2 6.0mg; B_6 4.0mg; Niacin 40mg; B_{12} 0.02mg; Pantothenic 10mg; Folic 1.0mg; Biotin 0.08mg; Choline Cl 500mg; Antioxidant 125mg; Mn 6mg; Zn 60mg; Fe 24mg; Cu 6mg; I 1.4mg; Se 0.24mg; Co 0.4mg. Product of Agricultural Technologies Nigeria Ltd. Marketed by S&D Farms Abeokuta.*

The birds were held on a basal diet for the first 2 days and monitored for problems that may be associated with hatchery defects and other sources of variations that could cause reduced performance and death which were independent of dietary treatments. The birds were reared according to standard procedures outlined by Dafwang and Ogundipe (1982).

The birds were fed each of starter diets for 28 days and thereafter fed each of finishing diets for 21 days. The birds in each treatment were fed weighted amounts of their group diet to appetite daily and fresh water was offered *ad libitum* throughout the period of the study while necessary prophylaxis and vaccinations for broilers were administered. The left over feed was collected and weighed before another days' feeding to determine actual intake. The birds were weighed weekly to determine weight changes. Feed conversion ratio was computed by dividing daily feed intake by the corresponding weight gain. Feed cost per unit weight gain was computed as a product of feed conversion ratio and feed cost per kg of each diet at the time of conducting the study. The dietary feed cost was obtained from the market prices of the different ingredients at the time and locality of the study. Data on feed intake, weight gain, feed: gain ratio and feed cost per unit weight gain were recorded on replicate basis weekly for 49 days.

Data on each parameter were subjected to the analysis of variance (ANOVA) for Completely Randomized Design (CRD) and where significant differences were indicated, the means were separated using Duncan's Multiple Range Test (DMRT) according to the procedures of the Statistical Package (SPSS, 2006).

Results

The summary of results of the response of broiler chickens to graded levels of untreated and urea treated rice offal are presented in Table 4.

Table 4: Response of broiler chickens to graded levels of untreated and urea treated rice offal

	Dietary Treatments					
Parameters	**I**	**II**	**III**	**IV**	**V**	**SEM**
Average daily feed intake (g)	98.30	96.87	101.16	110.13	109.43	5.03^{NS}
Average daily weight gain (g)	43.85	44.66	43.03	46.47	49.53	2.24^{NS}
Feed conversion ratio	2.98	2.14	2.53	2.32	2.26	0.13^{NS}
Feed cost per unit weight gain (₦/gain)	213.40^{b}	142.70^{a}	167.70^{ab}	143.02^{a}	140.01^{a}	9.01

[abc]Means followed by the same superscript in horizontal rows are not significantly different (P>0.05) from one another; SEM = Standard Error of Mean.

As the results have shown, there were no significant differences (P>0.05) in feed intake, weight gain and efficiency of feed utilization among birds fed the control diet, untreated and urea treated rice offal. However, feed intake was lower with birds fed 15.0% urea treated rice offal than their counterparts fed 15% untreated rice offal, but higher than those fed the control diet and 7.5% untreated and urea treated rice offal. Weight gain was better with birds fed 15.0% urea treated rice offal than those fed other diets. Weight gain increased by 11.47% when 15.0% urea treated rice offal was fed compared with birds fed the control diet. Furthermore, efficiency of feed utilization was best with those fed with 7.5% level of inclusion of untreated rice offal. It was observed in the present study that birds fed 15.0% urea treated rice offal had better efficiency of feed utilization than those fed either 7.5% urea treated rice offal or 15.0% untreated rice offal. Finally, the results show that feed cost per unit weight gain significantly (P<0.05) improved with birds fed all the untreated and urea treated rice offal compared with those fed the control diet. However, there were no significant differences (P>0.05) in feed cost per unit weight gain among birds diets fed diets containing either untreated or urea treated rice offal; with birds fed the diet containing 15.0% urea treated rice offal supporting the best feed cost per unit weight gain.

Discussion

In the present study, it was observed that 15.0% untreated or urea treated rice offal increased feed intake compared with birds fed other diets. The result of the present study is not consistent with those of Iheukwumere *et al.* (2001) and Yakubu *et al.* (2007) who reported lower feed intake with birds fed urea treated rice milling waste when compared to those fed untreated rice milling waste. The high feed intake in the present study could be attributed to the effect of the urea treatment on the fibre content of rice offal. The results of feed intake in the present study is, however, consistent with those of Dafwang and Damang (1995) and Oyawoye and Nelson (1999) who variously reported that rice offal can be added at levels of 10 – 15% in broiler feeds. Weight gain at 15.0% level of inclusion of urea treated rice offal was highest compared with birds fed diets fed other diets. The results of the present study is consistent with the reports of Amaefule *et al*. (2006) who observed that broilers fed urea treated rice milling wastes had significantly higher final body weight and daily weight gain than those fed other diets. It is known that the chicken is known to be especially sensitive to dietary energy concentration (Scott *et al*., 1982). In the present study, the energy content of the diets decreased with increasing levels of urea treated rice offal. Since energy intake is a productive function of feed intake, the higher feed intake of birds fed the urea treated rice offal in the present study could have been responsible for their higher weight gain. Improved weight gain of birds fed urea treated rice offal may have been due to reduced crude fibre and increased crude protein contents of the by-product since urea grade fertilizer contain 46% nitrogen.

Efficiency of feed utilization in the present study of birds fed 15.0% urea treated rice offal was better than those fed 7.5% urea treated or 15.0% untreated rice offal. The results of the present study agrees with earlier reports of Abu *et al.* (1999) in rabbits and Iheukwumere *et al.* (2001) in broilers who reported an increase in weight gain and efficiency of feed utilization when birds were placed on diets containing urea treated rice-milling waste. Feed cost/kg gain was highest (₦151.42/kg gain) with birds fed the control diet and least (₦139.87/gain) with birds fed 7.5% urea treated rice offal in the present study. The poor feed utilization of birds fed the 7.5% urea treated rice offal may have been responsible for their low weight gain and therefore feed cost per unit weight gain.

On the basis of the results obtained, it may be recommended that untreated or urea treated rice offal could be included at up to 15.0% of the diet of broiler chickens without any adverse effect on their performance.

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