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Research article

Response of broiler chickens to graded levels of urea treated rice offal and sorghum spent grain

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Abstract

A total of one hundred and fifty day-old unsexed broiler chickens averaging 50.00 g were utilized for the purpose of accessing their response to graded levels of urea treated rice offal and sorghum spent grain. These were randomly allocated into 5 equal groups of 30 birds in each treatment replicated 3 times. Five diets were designated as control (I), urea treated rice offal at the rate of 7.5% (II), urea treated rice offal at the rate of 15% (III), urea treated sorghum at the rate of 7.5% (IV) and urea treated sorghum at the rate of 15% (V) was included. The results showed that there were no significant differences (P>0.05) in all parameters measured among birds fed all diets. However, it was observed that feed intake increased in urea treated sorghum spent grain at 7.5% inclusion compared with the same level of rice offal, however, feed intake reduced in sorghum spent grain at 15.0% inclusion compared with the same level of inclusion of rice offal. Furthermore, weight gain increased when 7.5% urea treated sorghum spent grain was fed compared with birds fed the same level of urea treated rice offal but reduced with 15.0% inclusion compared with the same level of inclusion of urea treated rice offal. Efficiency of feed utilization at 15.0% level of inclusion of urea treated rice offal was better compared with birds fed other urea treated diets. Finally, feed cost per unit weight gain improved with urea treatment of sorghum spent grain. On the basis of the results obtained, it may be recommended that urea treatment of rice offal or sorghum spent grain could be included up to 15.0% of the diet of broiler chickens without any adverse effect on their performance.

Keywords: Broilers; urea; rice offal; sorghum spent grain

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Introduction

Competition between man and livestock for maize and other conventional feed stuffs is increasing day by day thus the need to search for alternative and perhaps cheaper agro-industrial wastes is also increasing (Amaefule et al., 2006). Rice offal which makes up about 40% of the parboiled rice and contains husk, bran polishing and small quantities of broken grains has been neglected as animal feed because it contains high level of fibre and low protein and energy (Oyawoye and Nelson, 1999).

Maikano (2007) reported that proximate composition of rice offal include 94.42% dry matter,

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5.09% crude protein, 30.39% crude fibre, 3.40% ether-extract, 16.67% ash and 46.10% nitrogen free-extract. Dafwang and Shwarmen (1996) 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 (Abasiekong, 1997) and consequent poor growth performance due to the presence of non-starch-polysaccharides (NSP) and phytate without any form of treatment. The use of rice offal to replace cereals in poultry diets has been studied (Dafwang and Damang, 1995; Carew et al., 2005) and fed to broiler chickens at lower levels (Onuh, 2006; Maikano, 2007; Yakubu et al., 2007).

Similarly, sorghum brewer's grain is cheap and readily available. Although the nutritional qualities of brewers' dried grains have been evaluated in the diets of poultry with some success (Uchegbu and Udedibie, 1998; Onuh, 2006), its maximum utilization has been limited by its high fibre content.

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 content. Alkali treatment of various fibrous materials (Faniyi and Ologhobo, 1999) and urea treatment ((Yakubu et al., 2007; Isikwenu et al., 2008; Onuh, 2011) have been reported to improve its nutritional qualities.

Therefore, this study was conducted to determine the response of broiler chickens to graded levels of untreated and urea treated rice offal and sorghum spent grain.

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 used in the present study was collected from Rice Mill in Gboko, Benue State. Similarly, the sorghum spent grain used in the present study was purchased from women who prepare traditional cereal based beer, commonly referred as *Burukutu* in Gboko, Benue State, Nigeria. It was then sun dried for 7 days.

The urea treatment of rice offal or sorghum spent grain was carried out according to the procedures outlined by Isikwenu et al. (2008). Each of the urea treated rice offal or sorghum spent grain was then sun dried for 2 days. The proximate chemical composition of untreated and urea treated rice offal and sorghum spent grain 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 g were utilized in this 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 diets designated as I, II, III, IV and V were formulated for broiler chickens such that urea treated rice offal (UTRO) was included at 7.5% and 15.0% (II and IV respectively) and 7.5% and 15.0% urea treated sorghum spent grain (UTSSG) III and V respectively and all these were compared with the control diet (I). Diets were adequately fortified with vitamins and minerals. The compositions of the broiler starter and finishing diets are presented in Tables 2 and 3 respectively.

Table 1: Proximate chemical composition of untreated and urea treated rice offal and sorghum spent grain

Constituent	[a]UNTRO	[b]UTRO	[c]UNTSSG	[d]UTSSG
Crude protein (%)	5.09	14.50	27.90	38.52
Crude fibre (%)	30.39	25.00	7.40	4.87
Ether extract (%)	3.40	7.37	11.70	4.49
Ash (%)	16.67	11.52	4.80	5.99

Sources: [a]Maikano (2007); [b]Yakubu et al. (2007); [c]Aduku (1993); [d]Isikwenu et al. (2008); UNTRO = Untreated rice offal; UTRO = Urea treated rice offal; UNTSSG = Untreated sorghum spent grain; UTSSG = Urea treated sorghum spent grains.

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 finishing diets for 21 days. The birds in each treatment were fed weighed amounts of their diet daily and fresh water was offered *ad libitum* throughout the period of the study while necessary prophylaxis and vaccinations for broilers were administered. 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

Table 2: Composition of broiler starter experimental diets

Ingredient	Dietary Treatments				
	I	II	III	IV	IV
	Control	7.5% UTRO	15.0% UTRO	7.5% UTSSG	15.0% UTSSG
Maize	45.00	40.50	33.00	43.50	41.00
Full-fat Roasted Soyabean	51.00	48.00	48.00	45.00	40.00
Urea Treated Rice Offal	0.00	7.50	15.00	0.00	0.00
Urea Treated Sorghum Spent Grain	0.00	0.00	0.00	7.50	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	22.97	23.39	23.90	24.67
Metabolizable Energy (Kcal/kg)	3213	2961	2706	2964	2714
Crude Fibre (%)	3.71	5.33	7.05	3.68	3.69
Methionine (%)	0.67	0.64	0.62	0.62	0.59
Lysine (%)	1.79	1.69	1.67	1.62	1.47
Methionine + Cystine (%)	0.93	0.88	0.86	0.86	0.80
Feed cost/kg (/kg)	74.65	69.63	64.75	69.47	64.35

UTRO = Urea Treated Rice Offal; UTSSG = Urea Treated Sorghum Spent Grain; $^{+}$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

Design (CRD). Where significant differences were indicated, the means were separated using Duncan's Multiple Range Test (DMRT) according to the procedure 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 and sorghum spent grains are presented in Table 4.

The results showed that there were no significant difference (P>0.05) in the measured parameters between groups fed treated diets. However, it was observed that feed intake increased with increasing levels of urea treated rice offal and 7.5% sorghum spent grain when compared with those fed the control diet. Feed intake increased by 9.11% when 7.5% urea treated sorghum spent grain was included in comparison with birds fed the control diet. Conversely, 15.0% urea treated sorghum spent grain depressed feed intake when compared with birds fed the control diet and 15.0% urea treated rice offal. Urea treatment increased feed intake of sorghum spent grain at 7.5% inclusion compared with the same level of inclusion of rice offal but reduced feed intake of sorghum spent grain at 15.0% inclusion compared with the same level of inclusion of rice offal. Furthermore, weight gain increased by 13.12% when 7.5% urea treated sorghum spent grain was fed compared with birds fed the same level of urea treated rice offal. However, urea treatment of sorghum spent grain reduced weight gain at 15.0% inclusion compared with the same level of inclusion of urea treated rice offal. Efficiency of feed utilization at 15.0% level of inclusion of urea treated rice offal was better compared with birds fed other urea treated diets. The efficiency of feed utilization, however, was similar among birds fed 7.5% and 15.0% urea treated sorghum spent grain. Finally, feed cost per unit weight gain improved with urea treatment of either rice offal or sorghum spent grain. Finally, feed cost per unit weight gain improved with urea treatment of either rice offal or sorghum spent grain. It was observed that birds fed the diet containing 15.0% of urea treated sorghum spent grain had better feed cost per unit weight gain than those fed other diets.

Discussion

In the present study, it was observed that feed intake decreased with increasing levels of urea treated rice offal and sorghum spent grain. The result of the present study is consistent with those of Iheukwumere et al. (2001) and Yakubu et al. (2007) who reported lower feed intake in 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. Urea treatment may probably reduce fibre content and hence increased feed intake. Weight

Table 3: Composition of finishing broiler experimental diets

Ingredient	Dietary Treatments				
	I Control	II 7.5% UTRO	III 15.0% UTRO	IV 7.5% UTSSG	IV 15.0% UTSSG
Maize	46.00	42.50	40.00	46.50	48.00
Full-fat Roasted Soyabean	38.00	34.00	29.00	30.00	21.00
Urea Treated Rice Offal	0.00	7.50	15.00	0.00	0.00
Urea Treated Sorghum Spent Grain	0.00	0.00	0.00	7.50	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	19.13	18.10	19.78	19.38
Metabolizable Energy (Kcal/kg)	3105	2855	2605	2859	2612
Crude Fibre (%)	4.82	6.41	6.05	4.73	4.60
Methionine (%)	0.61	0.58	0.54	0.56	0.50
Lysine (%)	1.47	1.35	1.21	1.25	1.00
Methionine + Cystine (%)	0.85	0.80	0.74	0.77	0.68
Feed cost/kg (/kg)	68.84	63.76	58.64	63.56	58.24

UTRO = Urea Treated Rice Offal; UTSSG = Urea Treated Sorghum Spent Grain; $^{+}$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 chloride 500mg; Antioxidant 125mg; Mn 6mg; Zn 60mg; Fe 24mg; Cu 6mg; I 1.4mg; Se 0.24mg; Co 0.4mg

Table 4: Response of broiler chickens to graded levels of urea treated rice offal and sorghum spent grain

Parameters	Dietary Treatments					SEM
	I	II	III	IV	V	
Average daily feed intake (g)	99.46	101.16	100.74	109.43	98.02	7.93^{NS}
Average daily weight gain (g)	47.56	43.03	45.11	49.53	41.66	3.36^{NS}
Feed conversion ratio	2.17	2.53	2.18	2.26	2.26	0.14^{NS}
Feed cost per unit weight gain (/gain)	165.75	167.09	145.06	139.87	138.41	9.59^{NS}

NS = Not significantly different (P>0.05) from one another; SEM = Standard Error of Mean

gain at 7.5% level of inclusion of urea treated sorghum treated sorghum spent grain compared with birds fed other diets in the present study is consistent with the reports of Amaefule et al. (2006) who found that urea treatment of agro-industrial 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 diets in the present study could have been responsible for the higher weight gain. 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 rice offal and 7.5% and 15.0% sorghum spent grain. The results of the present study showed that urea treatment results in high feed intake and weight gain agreed 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 agro-by-products. Feed cost/kg gain was highest (165.75/kg gain) in birds fed the control diet and least (138.41/gain) in birds fed 15.0% urea treated sorghum spent grain in the present study. Urea treatment reduced feed cost and therefore feed cost per unit weight gain.

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

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