CARCASS CHARACTERISTICS AND BIO-ECONOMICS OF BROILER CHICKENS FED UREA TREATED AND UNTREATED RICE MILLED WASTE.

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ABSTRACT

Carcass characteristics and bio-economics of broiler chickens fed urea treated and untreated rice milled waste was evaluated using seventy five (75) day-old broilers randomly allotted into five treatments with 3 replicates each containing five birds. Five experimental diets T_1, T_2, T_3, T_4 and T_5 containing 0% UNTRMW, 10% UNTRMW, 15% UNTRMW, 10% UTRMW and 15% UTRMW, respectively were formulated for both the starter and the finisher diets. At the starter phase, feed cost per Kg feed and feed cost per Kg gain were highly significant ($p < 0.01$) by the experimental diets. Feed conversion ratio was significant ($p < 0.05$). From the finisher phase, FCR, feed cost/Kg gain, feed cost/Kg feed and cost benefit ratio (CBR) were highly significantly different ($p<0.01$). Gross margin was significant ($p<0.05$). T_3 was better in Feed Cost per Kilogram (N), while T_2 was better in feed cost per kilogram gain (₦) at the starter phase. T_4 (10% UTRMW) had the best Cost Benefit Ratio, Gross margin, and live weight after T_1. Wing weight was highly significant ($p<0.01$) while live weight, plucked weight, dressed weight dressing %, and the weights of the thigh, back, breast, neck and shank were significantly different ($P<0.05$). T_4 had the highest dressing % (74.14%). 10% dietary level of inclusion of UTRMW and levels below 10% of UNTRMW is recommended in broilers diet.

Keywords: Urea, Carcass, Bio-economics, Rice milling waste, Broilers, Urea-treated, Urea-untreated

INTRODUCTION

Nigerians on the average consume about 10 gram of animal protein per day which translates to 1400 metric tonnes per day or 511,000 tonnes per year (Njoku, 2011). This consumption level is less than the FAO recommended animal protein requirement of 35 gram, for every adult per day. Njoku (2011) also observed that over 50% of meat and 95% of milk product consumed in Nigeria are imported from neighboring countries.

Rice milling waste is the byproduct of a one-step rice milling process that is primarily sourced from paddy rice. Nigeria Paddy rice production is estimated to be at 475.52 million tonnes (NAERLS and NFRA, 2009) and has the potential of producing 190 million tonnes of rice offal. Therefore, large quantities of rice offal are available for use in animal feeds in Nigeria. This abundant feed resource is limited in utilization due to its poor nutrient status. Tiemako (1994) reported that the nutrient profile of rice waste could be improved by processing techniques such as chemical treatment with urea.

Tuleun *et al*. (2009) evaluated the performance of growing pullets fed rice offal based diets supplemented with Roxazyme G® enzyme and reported that average feed intake significantly (P<0.05) increased as dietary inclusion of rice offal increased without and with enzyme supplementation. The increased feed intake of birds on the diets containing rice offal was within expectation. Rice offal contains high fibre which tends to increase the total fibre content of the diet, decreased energy density and dilute other nutrients. Birds therefore would have to eat more to meet their energy requirements to sustain growth and development, hence, the increased feed intake. Similar findings were also reported by Anyachie and Madubuike (2004), Esonu *et al.* (2004), and Alawa *et al*. (1990) who indicated that the enhanced feed intake at higher fibre levels was compensated for the reduced energy density of such diets and the effects of enzyme addition. These observations were in line with those of Ohwota (2001), Apata and Ojo (2002) and Nnenna *et al*. (2006). This study investigates the effects of untreated and urea treated rice milling waste on carcass characteristics and bio-economics of broiler chickens.

MATERIALS AND METHODS

Preparation and Procedure for Treating Rice Milled Waste

The test diet (Rice Milling Waste) was collected from a rice mill at Itobe in Kogi State. Fifty kilogram (50kg) out of the rice milling waste was soaked in a plastic drum containing 75 litres of water with 1 kg of urea (fertilizer grade) dissolved in it after which the drum was made air-tight by sealing it with a polythene sheet and left to ferment for seven days and later sundried for 72 hours. It was then incorporated at varying levels in the experimental diets (Both Starter and Finisher Phase).

Management of Experimental Birds

The broilers in each replicate were brooded in a deep litter brooding room of the Experimental poultry house for 3 weeks. Heat was provided with kerosene stoves under metal hovers. Feed and water were provided to the broilers *ad libitum* while additional light was sometimes provided at night using electricity. The birds were given VITALYTE for 5 consecutive days from day-old. Lasota vaccine was administered on days 7 and 21, while Gumboro disease vaccine on days 24 and 28. Broad-spectrum antibiotics and coccidiostat were administered to the birds. The experiment lasted for 9 weeks.

Bio-economics of Experimental Birds

Initial weights of goats were obtained at the beginning of the experiment by the use of a weighing scale. Final weight was obtained by weighing the animals at the end of the experiment. Daily weight gain was obtained by dividing the total weight gain by the no of days the experiment lasted. Daily feed intake was obtained by dividing the total feed intake by the no of days the experiment lasted. Feed conversion ratio was calculated as the ratio of total feed intake in grammes to the total weight gained in grammes. Feed cost per kg was calculated based on the prices of feed stuffs used. Feed cost per kg gain was obtained from the product of feed conversion ratio and feed cost per kg. Cost benefit ratio was calculated as the ratio of revenue to the total variable cost of production. Gross margin was calculated by subtracting the total variable cost of production from the selling price (revenue).

Carcass Evaluation

At 9 weeks of age, 3 broilers from each treatment were randomly selected, starved for 12 hours and weighed. They were bled completely with a knife by cutting the neck. The feathers were plucked and weighed. After evisceration, the shank and internal organs were removed to obtain the warm dressed weight. All parts (Drum sticks, Thighs, Wings, Back, Breast, Neck, Head, and Shank) were weighed using electronic micro-scale.

Data Collection and Statistical Analysis

Data on vitamins and amino acids were collected. Data obtained from vitamin were subjected to a one way analysis of variance (ANOVA) using SPSS (2010) Inc. 16.0 Evaluation Version for windows in a Complete Randomized Design (CRD). Significant mean levels were separated using Least Significant Difference.

Chemical Analysis

The proximate compositions of the experimental diets were determined according to AOAC, (2000).

RESULTS

Determined Proximate Composition of Experimental Diets (starter and finisher phase)

Proximate compositions of experimental diets are presented in Tables 1 and 2. Dietary crude protein increased with increase in urea treated Rice Milling Waste inclusion. There was slight increase in Ether Extract from the control diets which ranged between 6.1-5.1%. The CF and Ash, did not increase in a definite order, while NFE was highest in T_1 and did not decrease in a definite order from T_2 to T_5.

Table 1: Gross Composition and Proximate Composition of Experimental Diets for Broiler Starter

Ingredient	T_1 (0% UNTRMW)	T_2 (10% UNTRMW)	T_3 (15% UNTRMW)	T_4 (10% UTRMW)	T_5 (15% UTRMW)
Maize	32.50	23.3	17.9	23.3	17.9
GNC	28.2	32	34.3	32	34.3
BNW	17	20	20	20	20
BDG	15	5	2	5	2
RMW	0.0	10	15	10	15
Fish Meal	3	3	3	3	3
Bone Meal	2	2	2	2	2
Palm Oil	2	4	5	4	5
Premix	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Methionine	0.2	0.2	0.2	0.2	0.2
Lysine	0.1	0.1	0.1	0.1	0.1
Total	**100**	**100.1**	**100**	**100.1**	**100**
Calculated Analysis					
ME Kcal/kg	2804.5	2789.6	2748.2	2789.6	2748.2
CP (%)	23.1	23.4	23.2	23.04	23.2
Proximate Composition (%)					
Dry matter	93.84	92.47	91	93.1	95
Crude Protein	21.57	22	22.4	24.8	25.5
Crude fiber	5.8	7.0	7.9	6.5	7.0
Ether extract	6.2	8.1	8.5	8	8.2
Ash	7.3	7	7.1	7.2	7.8
NFE	59.13	55.9	54.1	53.5	51.5

Premix Bio-Mix® supplied per tonne: Vit A 5,000000 I.U., Vit D_3 1,000000 I.U., Vit E 20,000 mg, Vit K_3 1000 mg; Vit B_1, 1200 mg, Vit B_2 2400 mg, Vit B_6 2400 mg, Niacin 16,000 mg; Calcium Pantothenate 4,000 mg Biotin 32 mg; Vit B_{12} 10 mg; Folic Acid 400 mg; Chlorine Chloride 120,000 mg: Manganese 40,000 mg; Iron 20,000 mg: Zinc 18,000. Copper 800 mg; Cobalt 100 mg, Iodine 620 mg, Selenium 40 mg. .ME: Metabolisable Energy, NFE: Nitrogen Free Extract, GNC:Groundnut Cake, BNW: Bambaranut Waste, BDG: Brewers Dried Gain, RMW: Rice Milled Waste, UNTRMW: Untreated Rice Milled Waste, UTRMW: Urea Treated Rice Milled Waste.

Table 2: Gross Composition and Proximate Composition of Experimental Diets for Broiler Finisher

Ingredient	T_1 (0%UNTRMW)	T_2 (10%UNTRMW)	T_3 (15%UNTRMW)	T_4 (10%UTRMW)	T_5 (15%UTRMW)
Maize	36.2	32	26.6	32	26.6
GNC	20.0	26.2	26.6	26.2	26.6
BNW	20	20	20	20	20
BDG	17	4	2	4	2
RMW	0	10	15	10	15
Fish Meal	2	2	2	2	2
Bone Meal	2	2	2	2	2
Palm Oil	2	3	5	3	5
Premix	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Methionine	0.20	0.20	0.20	0.20	0.2
Lysine	0.1	0.1	0.1	0.1	0.1
Total	**100**	**100**	**100**	**100**	**100**
Calculated Analysis					
ME Kcal/kg	2848.64	2818.74	2830.4	2818.74	2830.4
CP	20.1	20.01	20.02	20.01	20.02
Proximate Composition (%)					
Dry matter	95	94.87	93.7	96	95.3
Crude Protein	19.78	19.90	20	22.1	22.8
Crude fiber	6	10.8	11.5	9	10.0
Ether extract	5.1	6	6.1	5.9	6
Ash	8.0	8.8	9.4	9	8.9
NFE	61.12	54.5	53	54	52.3

Premix Bio-Mix® supplied per tonne: Vit A 5,000000 I.U., Vit D_3 1,000000 I.U., Vit E 20,000 mg, Vit K_3 1000 mg; Vit B_1, 1200 mg, Vit B_2 2400 mg, Vit B_6 2400 mg, Niacin 16,000 mg; Calcium Pantothenate 4,000 mg Biotin 32 mg; Vit B_{12} 10 mg; Folic Acid 400 mg; Chlorine Chloride 120,000 mg: Manganese 40,000 mg; Iron 20,000 mg: Zinc 18,000. Copper 800 mg; Cobalt 100 mg, Iodine 620 mg, Selenium 40 mg. ME: Metabolisable Energy, NFE: Nitrogen Free Extract, GNC: Groundnut Cake, BNW: Bambaranut Waste, BDG: Brewers Dried Gain, RMW:

Carcass Characteristics of Broilers Fed Urea Treated and Untreated Rice Milling Waste

Table 3 presents the various carcass cuts and the weights of individual parts. All parameters were expressed as percentage live weight. Live weight, plucked weight, dressed weight, dressing %, thighs, back, breast, neck and shank weights were all significantly different (P<0.05) while significant difference (P<0.01) was observed in wings weight. T_1 had the highest live weight with an appreciable weight of 2138g/bird, while T_3 recorded the lowest (1440 g/bird).

Table 3. Carcass Characteristics of Broilers Fed Urea Treated and Untreated Rice Milled Waste

Parameter	T_1 0% UNTRMW	T_2 10% UNTRMW	T_3 15% UNTRMW	T_4 10% UTRMW	T_5 15% UTRMW	LOS
live weight (g)	2138.00±167.02[a]	1776.67±143.33[ab]	1440.00±20.82[b]	1916.67±197.85[a]	1776.67±50.44[ab]	*
Plucked wt (g)	95.29±0.37[a]	94.26±0.38[a]	92.12±0.55[b]	94.84±0.64[a]	94.13±0.23[a]	*
Dressed wt (g)	72.83±0.34[a]	70.40±1.08[ab]	65.27±1.03[ab]	74.33±0.99[a]	71.20±1.48[ab]	*
Dressing %	72.82±0.34[ab]	70.38±1.13[b]	65.29±1.03[c]	74.14±0.98[a]	71.20±0.24[b]	*
Drum stick (g)	10.37±0.22	10.10±0.45	10.13±0.10	10.42±0.40	10.20±0.11	NS
Thighs (g)	11.77±0.38[b]	11.21±0.27[b]	11.53±0.05[b]	13.06±0.33[a]	11.56±0.23[b]	*
Wings (g)	7.89±0.12[bc]	7.81±0.16[bc]	8.35±0.13[a]	8.12±0.16[ab]	7.68±0.04[c]	**
Back (g/bird)	17.55±0.36[a]	16.34±1.53[ab]	15.03±0.19[b]	17.48±0.20[a]	17.59±0.20[a]	*
Breast (g/bird)	19.72±0.40[a]	19.84±0.10[a]	16.67±0.17[b]	19.74±0.22[a]	19.91±0.28[a]	*
Neck (g/bird)	5.43±0.20[a]	4.56±0.42[ab]	4.57±0.18[ab]	5.03±0.30[a]	4.40±0.10[b]	*
Head (g/bird)	3.13±0.11	3.19±0.17	3.10±0.03	2.90±0.08	2.98±0.02	NS
Shank (g/bird)	4.35±0.14[ab]	4.28±0.19[ab]	4.72±0.12[a]	4.10±0.14[b]	4.34±0.10[ab]	*

abc: means in the same row with different superscripts differ significantly (P<0.05); UNTRMW: Untreated Rice Milling Waste, UTRMW: Urea Treated Rice Milling Waste; ,LOS : Level of significant; NS: Not significant.

Bio-economics of Broilers Fed Urea Treated and Untreated Rice Milled Waste

At the starter phase, feed cost per Kg feed and feed cost per Kg gain were highly significant (p< 0.01) while FCR was significant (p< 0.05). T2 was observed to have the best feed conversion ratio (1.87). T3 had the lowest feed cost/kg. At the finisher phase, FCR, Feed cost/Kg gain and CBR were highly significantly different (P<0.01) while Gross margin was significantly different (P<0.05) (Tables 4 and 5).

Table 4: Bio-Economics of Broiler Starters Fed Urea Treated and Untreated Rice Milling Waste

Parameters	T10% UNTRMW	T210% UNTRMW	T315% UNTRMW	T410% UTRMW	T515% UTRMW	LOS
Initial weight	73.10±0.25[b]	73.67±0.32[a]	72.50±0.25[b]	73.37±0.37[ab]	73.43±0.28[ab]	*
Final weight	666.93±33.58[a`]	634.17±39.68[a]	526.33±37.10[b]	480.53±24.14[b]	513.93±22.86[b]	*
Daily wt gain	21.210±1.20[a]	20.02±1.43[a]	16.21±1.33[b]	14.54±0.86[b]	15.73±0.83[b]	*
Daily feed intake	46.08±0.75	47.02±5.36	43.82±1.03	41.85±0.53	44.64±3.90	NS
Feed conversion ratio	2.18±0.10[b]	1.87±0.22[a]	2.84±0.19[c]	2.90±0.22[c]	2.57±0.35[ab]	*
Feed cost/kg(N)	65.83±0.33[a]	62.30±0.00[bc]	60.00±0.00[c]	63.97±1.67[ab]	60.50±0.00[c]	**
Feed cost/kg gain(N)	143.69±5.60[b]	116.71±13.49[a]	172.02±11.56[c]	180.88±13.60[c]	155.49±21.36 [ab]	**

abc: means in the same row with different superscripts differ significantly (P<0.05). LOS: Level of significant; NS: Not significant
UNTRMW: Untreated Rice Milling Waste, UTRMW: Urea Treated Rice Milling Waste.

DISCUSSION

As observed from the results of proximate analysis (Tables 1 and 2), the non-protein nitrogen contribution from urea may have brought about the increase in crude protein. This agreed with the reports (William *et al.,* 1984 and Amaefule *et al.,* 2003) that urea ammoniation increases the crude protein content of feed materials including RMW. Although there was no complete degradation of fiber fraction of RMW due to urea treatment, the reduction in crude fiber content when compared with the untreated RMW diet (Tables 1 and 2) is worthy of note and this agreed with Amaefule, *et al.* (2006). The increased Ether Extract content across the treatments may be as a result of varied inclusion level of palm oil. The increase observed in Ash content in Tables 1 and 2 from the control diet maybe as a result of the inclusion of RMW which is known to have considerable level of ash. The best feed conversion ratio (FCR) for T_2 and T_1 at both starter and finisher phases respectively may have brought about their higher final body weights. The low feed cost/kg of T_3 and T_5 in Table 3 could be associated with the level of inclusion (15%) of rice milling waste which is very cheap.

The result of carcass yield indicated that the significantly (P<0.05) higher live weight, and dressed weight exhibited by birds on diets containing 10% UTRMW, could be attributed to better utilization of the UTRMW and probably because of the protein content of UTRMW. The observed higher mean live weight, consequently resulted in higher dressed weight and dressing percentage. This tallied with the findings ofOjewola *et al.* (2000) who recorded dressing percentage range of 61.25% to 68.81%. These findings were also in line with the results of Babatunde *et al.* (1998); Akunusi (1999); and Oyawoye and Nelson (1999), they all observed that dressed weight and dressing percentage decreased as levels of UNTRMW increased in the diets. Amaefule *et al.* (2006) however reported a significant difference only in percent dressed weight of the broilers.

CONCLUSION AND RECOMMENDATION

The results of this study showed that rice milling waste (RMW), which is cheap and readily available, when treated with urea could be utilized in both starter and finisher broiler diet. The results also suggests that urea treated rice milling waste inclusion to broiler ration at 10 percent inclusion level is well tolerated by broilers and improves feed consumption and market weight significantly. And it establishes the fact that inclusion of untreated RMW up to or above 15% in broiler diet affects the final weight of birds. Urea treated rice milling waste (UTRMW) is therefore recommended at 10% dietary level of inclusion in broiler feed. Urea treatment is safe and cheap and can be used to improve the crude protein

Table 5: Bio-Economics of Broiler Finishers (5 - 9week) Fed Urea Treated and Untreated Rice Milled Waste

Parameters	$T_1$0% UNTRMW	$T_2$10% UNTRMW	$T_3$15% UNTRMW	$T_4$10% UTRMW	$T_5$15% UTRMW	LOS
Initial weight (g/bird)	1046.67±29.10^a	860.00±30.55^b	713.33±46.67^c	973.33±26.67^{ab}	906.67±74.24^{ab}	**
Final weight(g/bird)	2266.67±88.19^a	1760.00±23.10^c	1420.00±41.63^d	1966.67±88.19^b	1646.67±29.10^c	**
Daily weight gain (g)	43.57±7.52	32.14±0.41	25.24±0.24	35.48±2.27	26.43±2.58	NS
Daily feed intake (g)	116.59±1.15^a	105.36±1.03^b	102.15±3.37^b	115.49±1.20^a	100.01±4.13^b	*
F C R	2.68±0.14^a	3.28±0.10^b	4.03±0.17^c	3.19±0.19^b	3.78±0.28^{bc}	**
Feed cost/kg(₦)	64.50±0.00^c	62.00±0.00^{bc}	60.00±0.00^a	62.00±0.00^{bc}	60.00±0.00^a	**
Feed cost/kg gain(₦)	173.73±9.30^a	203.15±3.94^b	243.00±0.00^c	203.36±11.72^b	229.80±17.01^{bc}	**
Cost benefit ratio	3.58±0.02^c	3.86±0.02^{ab}	3.99±0.10^a	3.72±0.56^{bc}	4.04±0.16^a	**
Gross margin	1009.23±1.9^b	1037.10±1.80^a	1048.37±5.64^a	1020.63±6.73^b	1051.97±6.96^a	*

abc: means in the same row with different superscripts differ significantly (P<0.05) ,LOS : Level of significant; NS: Not significant

UNTRMW: Untreated Rice Milled Waste, UTRMW: Urea Treated Rice Milled Waste.

of a feed ingredient. Increase in the length of fermentation during the treatment of RMW could lead to further degradation of the crude fibre content. Levels lower than 10% dietary level of inclusion of UNTRMW is recommended although 10% level as observed in this research did not have adverse effect on the carcass characteristics and the bio-economics of broiler chickens. Further research should be carried out with a view to improve fiber digestibility.

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