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Carcass Characteristics Of Broiler Chickens Fed Graded Level Of Rice Milling Residue As A Partial Replacement For Wheat Offal

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Abstract: *An eight (8) week experiment was conducted to assess the carcass characteristics of broiler chickens fed graded level of Rice Milling Residue (RMR) as a partial replacement for wheat offal (WO). Three hundred (300) day old Anak white strain unsexed broiler chicks which were randomly allocated to five (5) dietary treatments of sixty (60) chicks per treatment and replicated three (3) times with twenty (20) birds per replicate in a completely randomized design (CRD) were used. Five experimental diets were formulated with RMR replacing WO at 0, 25, 50, 75 and 100% representing treatments 1, 2, 3, 4 and 5 respectively. The result of the study showed no significant (P>0.05) difference in most of the parameters considered except in large intestine length, weight and heart that were significant (P<0.05). T5 (100%) RMR, the test diet has best performance in most parameters like live, Eviscerated, plucked and carcass weights above T1 (100%) WO, the control. T4 (75%) RMR has the best value (57.22%) dressing percentage followed by T1 (55.33%).*

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I. Introduction

The ultimate goal of livestock production is the attainment of sustainable production with minimum cost of production and maximum returns. The urgent need to arrest the skyrocketing cost of feed ingredients has prompted nutritionists, farmers and other players in the industry to shift research focus to alternative feedstuffs, which are locally available, cheap and within the reach of farmers. Nutrition is an important aspect of livestock production, which can be used to enlarge animal productivity and also reduced the cost of production. Within the poultry industry, 70-85% of the total cost of production is attributed to feeding cost (Ahaotu and Ekenyem, 2009). Ahaotu et al., (2009) stated that the ideal poultry diet should satisfy the requirement of the largest species for carbohydrate to achieve the maximum economic return.

However, in Nigeria, the major problem facing poultry farmers is not just high cost of carbohydrate feed resources but supplying the right quality and quantity of carbohydrate in diets (Uzzih and Iheagwanm, 2008). The availability and supply of other feed ingredients at minimum cost must also be vigorously pursued. The objective of the study is to evaluate the carcass characteristics of broiler chickens fed graded level of rice milling residue (RMR) as a partial replacement for wheat offal (WO).

II. Materials And Methods

Location Of Study Area

The study was conducted at Taraba State College of Agriculture Jalingo Poultry Units of the Teaching and Practical Farm. The College is in Ardo-Kola Local Government Area of Taraba State in the North-East geo-political zone of Nigeria. It lies between latitude $8^0$53" North and longitude $11^0$23" East of the Equator in the Guinea Savannah of the Northern Nigeria (Taraba State Diary, 2008). There are two main seasons existing in the area, the dry and rainy season with a temperature range of 30-42^{0}c depending on the seasons (Taraba State Diary, 2008).

Experimental Stock And Management

Three hundred (300) day old white mixed sex broiler chicks were used for the experiment. The chicks were brooded together on a deep litter management system for one (1) week in which they were fed commercial broiler starter feed with water adlibitum management practices including vaccination were carried out.

Experimental Diets And Design

The birds were weighed at the beginning of the experiment and randomly assigned to five (5) dietary treatments of sixty (60) birds per treatment designated T1, T2, T3, T4 and T5 respectively. Each treatment was replicated three (3) times coded R1, R2 and R3 with twenty (20) birds per replicate. Diets were formulated in which RMR replaced WO at 0, 25, 50, 75 and 100% for T1, T2, T3, T4 and T5 with T1 serving as control and T5 test diet. The treatments were arranged in a completely randomized design (CRD), where each treatment was randomly allocated within the poultry house. Feeding trials lasted for eight (8) weeks.

Experimental Diets

Tables 1 and 2 represents the ingredients composition of broiler starter and finisher diets respectively. The starter composed 48.59% of maize and 32.01% of soyabeans, while the finisher was 55.16% maize and 25.44% soyabeans. RMR replaced WO at 0, 25, 50, 75 and 100% for T1, T2, T3, T4 and T5. T1(100%) WO (control) and T5 (100%) RMR (test diet). All other ingredients were the same across the entire treatment groups.

Table 1. Ingredients Composition of Broiler Starter Diets (1-4 weeks)

	Levels of replacing of WO with RMR(%)				
Ingredient	**T1 (0%)**	**T2 (25%)**	**T3 (50%)**	**T4 (75%)**	**T5 (100%)**
Maize	48.59	48.59	48.59	48.59	48.59
Soya bean	32.01	32.01	32.01	32.01	32.01
Wheat offal	10	7.5	5.0	2.5	0
Rice Milling Residue	0	2.5	5.0	7.5	10
Fish Meal	5	5	5	5	5
Bone Meal	2	2	2	2	2
Lime Stone	1.5	1.5	1.5	1.5	1.5
Salt	0.25	0.25	0.25	0.25	0.25
Premix*	0.25	0.25	0.25	0.25	0.25
Lysine	0.2	0.2	0.2	0.2	0.2
Methionine	0.2	0.2	0.2	0.2	0.2
Total	**100**	**100**	**100**	**100**	**100**
Calculated analysis					
Crude Protein	23.05	22.98	22.91	22.84	22.77
ME/kcal/kg energy	2909.37	2929.37	2949.37	2969.37	2989.37
Crude fibre(%)	3.30	3.63	3.59	3.53	3.68
Calcium (%)	1.55	1.58	1.55	1.55	1.56
Phosphorous (%)	0.90	0.92	0.93	0.95	0.97
Lysine (%)	1.64	1.63	1.62	1.61	1.60
Methionine (%)	0.41	0.52	0.41	0.42	0.42

*Vitamin-mineral premix provider per kg the following: Vit. A 1500 IU; Vit.D_3 3000 IU; Vit.E 30 IU; Vit.K 2.5mg; Thiamine B_1 3mg; Riboflavin B_2 6mg; Pyrodoxine B_6 4mg; Niacin 40 mg; Vit. B_{12} 0.02mg; Pantothenic acid 10mg;Folic acid 1mg; Biotin 0.08mg; Chloride 0.125mg; Mn 0.0956g; Antioxidant 0.125g; Fe 0.024g; Cu 0.006g; 10.0014g; Se 0.24g; Co 0.240g

Table 2. Ingredients Composition of Broiler Finisher Diets (5-8) weeks

	Levels of replacing of WO with RMR(%)				
Ingredient	**T1 (0%)**	**T2 (25%)**	**T3 (50%)**	**T4 (75%)**	**T5 (100%)**
Maize	55.16	55.16	55.16	55.16	55.16
Soya bean	25.44	25.44	25.44	25.44	25.44
Wheat offal	10	7.5	5.0	2.5	0
Rice Milling Residue	0	2.5	5.0	7.5	10
Fish Meal	5	5	5	5	5
Bone Meal	2	2	2	2	2
Lime Stone	1.5	1.5	1.5	1.5	1.5
Salt	0.25	0.25	0.25	0.25	0.25
Premix*	0.25	0.25	0.25	0.25	0.25
Lysine	0.2	0.2	0.2	0.2	0.2
Methionine	0.2	0.2	0.2	0.2	0.2
Total	**100**	**100**	**100**	**100**	**100**
Calculated analysis					
Crude Protein	20.00	20.00	20.00	20.00	20.00
ME/kcal/kg energy	2929.08	2949.08	2969.08	2989.08	3008.08
Crude fibre(%)	3.17	3.22	3.27	3.32	3.37
Calcium (%)	1.54	1.54	1.54	1.53	1.53
Phosphorous (%)	0.87	0.89	0.91	0.92	0.94
Lysine (%)	1.43	1.42	1.41	1.40	1.39
Methionine (%)	0.38	0.39	0.38	0.39	0.39

*Vitamin-mineral premix provider per kg the following: Vit. A 1500 IU; Vit.D_3 3000 IU; Vit.E 30 IU; Vit. K 2.5mg; Thiamine B_1 3mg; Riboflavin B_2 6mg; Pyrodoxine B_6 4mg; Niacin 40 mg; Vit. B_{12} 0.02mg; Pantothenic acid 10mg;Folic acid 1mg; Biotin 0.08mg; Chloride 0.125mg; Mn 0.0956g; Antioxidant 0.125g; Fe 0.024g; Cu 0.006g; 10.0014g; Se 0.24g; Co 0.240g

III. Data Collection

At the end of the experiment, the birds were starved of feed overnight but water was provided. Six (6) birds were randomly selected per treatment, two (2) per replicate. The birds were weighed before slaughtered and recorded as liveweight. Thereafter, the birds were slaughtered by severing the neck from the jugular vein and the blood drained out. They were then immersed in hot water to pluck out the feathers and the weight recorded as plucked weight. They were then cut to various parts including internal organs and their weights expressed as dressing percentage of liveweight.

Statistical Analysis

Data were subjected to analysis of variance (ANOVA) using SAS software (SAS; 2009). Means were separated with Duncan Multiple range test at 5% level of significance (Duncan, 1955).

IV. Results And Discussion

Proximate composition of rice milling residue (RMR) is presented on table 3. It comprises 8.75% crude protein (CP), the value is higher than 6.20% reported by Obeka et al., (2004) and lower than 10.03% reported by Ambashakar and Chandresekan (1998). The 36.99% crude fibre (CF) value agreed with 36.43% reported by Abu et al., (1991). It has 20.12% Ash, which is in agreement with 20.20% reported by Obeka (1985), 5.14% Ether Extract (EE) also in line with 5.01% reported by Oyeyiola (1991) and 25.66% Nitrogen Free Extract (NFE) lower than 30.54% reported by Obeka (1985) and higher than 23.38% reported by Oyeyiola (1991).

Table 3. Proximate Composition (%) Rice Milling Residue (RMR)

Nutrient	Composition (%)
Dry Matter (DM)	93.65
Crude Protein (CP)	8.75
Crude Fibre (CF)	36.99
Ash	20.12
Ether Extract (EE)	5.14
Nitrogen Free Extract (NFE)	25.66

Table 4 shows the gross compositions of the experimental starter and finisher diets with calculated values of crude protein (CP) and metabolizable energy (ME). The birds were given rations based on the specification of CP, CF and ME as suggested by Olumu (1979).

Table 4. Proximate Composition of the Experimental Broiler Starter and Finisher Diets

	Starter Diets					Finisher Diets				
Composition%	0	25	50	75	100	0	25	50	75	100
Dry Matter (%)	95.45	95.18	95.26	95.11	95.99	95.03	94.99	94.99	95.04	95.07
Crude Protein (%)	23.36	23.81	23.63	23.25	23.30	20.25	20.16	20.02	20.10	20.31
Crude Fibre(%)	2.80	3.63	3.92	4.58	5.05	2.81	3.64	3.60	3.39	3.50
Ash (%)	4.06	2.97	3.00	3.03	3.18	3.46	3.28	3.44	3.26	2.74
Ether Extract (%)	10.40	10.40	9.45	8.52	13.71	7.59	8.79	9.10	9.02	9.82
Nitrogen Free Extract (%)	54.83	55.84	55.26	55.73	50.75	60.92	59.12	58.83	59.27	58.70

Table 5 shows the result of carcass yield and internal organs characteristics of broiler chickens fed Rice milling residue (RMR). The result did not show significant ($P>0.05$) difference in most of the parameters except large intestine length, weight and heart that were significant ($P<0.05$); this agreed with the report of Amaefule et al., (2005). The significant of these organs can also be attributed to the findings of Babatunde et al., (1975) who reported that high levels of dietary fibre in a feed reduces food digestion, nutrient absorption and utilization. It is therefore expected that great energy must have been exerted by the digestive system to overcome the problem. Ojewole et al., (2000) also reported that one of the roles of dietary fibre is to absopb water in the intestinal lumen and produce large softer feaces that are easily eliminated. The high fibre levels in the intestine might have

caused dehydration of the intestinal lumen, thereby increase the size (hypertrophy). The marginal increase in the breast yield (heart girth) also agreed with the report of Ashley (2004), which could be due to increase crude fibre content of the diets. Also, the marginal increase in the length of intestine agreed with the report of Akintunde et al., (2012) and that of weight agreed with Adetola et al., (2012). Test diet, T5 (100%) RMR had the best values in most parameters considered like live (3733.33g), plucked (2566.67g), Eviscerated (2250.00g) and carcass (2066.67g) weights. While the dressing percentage was better in T4 (57.22%) followed by T1 (55.33%). The dressing percentage range (49.35 – 57.22%) is higher than (44.20 – 54.20%) reported by Bamgbose et al., (2004) but lower than 64.36 – 68.26%) reported by Amaefule et al., (2005). The insignificant effects (P>0.05) observed in liver, lungs, gizzard and kidney was an indication that the inclusion levels of RMR has no toxic elements, since it is a common practice as observed by Njidda and Isidahomen (2011) in feeding trials where weights of some internal organs like liver and kidney were used as indicator for toxicity. Bone (1979) reported that if there is toxicity in the feed, abnormalities in weights of liver and kidney would be observed. The abnormalities will arise because of increased metabolic rate of these organs in an attempt to reduce these toxic elements or convert anti-nutritional agents to non-toxic metabolites.

Table 5. Carcass yield and Internal Organs Characteristics of broiler chickens fed RMR.

Levels of Replacement of WO with RMR						
Parameters	**0%**	**25%**	**50%**	**75%**	**100%**	**SEM**
Carcass						
Live weight (g)	3400.00	3500.00	3200.00	3066.67	3733.33	215.12 ^{NS}
Plucked weight (g)	2316.67	2333.33	1950.00	2216.67	2566.67	166.50 ^{NS}
Eviscerated weight (g)	2083.33	2100.00	1733.33	1916.67	2250.00	171.27 ^{NS}
Carcass Weight(g)	1900.00	1916.67	1583.33	1750.00	2066.67	156.00 ^{NS}
Dressing % (D%)	55.71	54.63	49.35	57.22	55.33	2.75 ^{NS}
(% of live weight)						
Head (%)	0.05	0.06	0.06	0.06	0.05	0.20 ^{NS}
Neck (%)	0.11	0.12	0.10	0.13	0.11	0.31 ^{NS}
Breast (%)	0.44	0.42	0.43	0.51	0.37	1.73 ^{NS}
Thighs (%)	0.24	0.22	0.26	0.35	0.24	0.85 ^{NS}
Shanks (%)	0.09	0.09	0.09	0.11	0.08	0.28 ^{NS}
Drum sticks (g)	0.25	0.23	0.23	0.28	0.48	0.53 ^{NS}
Wings (%)	0.20	0.19	0.20	0.22	0.18	0.49 ^{NS}
Back (%)	0.19	0.19	0.19	0.19	0.19	0.54 ^{NS}
Chest (%)	0.13	0.11	0.12	0.15	0.13	0.32 ^{NS}
Internal Organs						
Gizzard (%)	0.05	0.05	0.06	0.06	0.06	0.55 ^{NS}
Kidney (%)	0.01	0.01	0.01	0.02	0.01	0.07 ^{NS}
Liver (%)	0.05	0.04	0.04	0.05	0.04	0.15 ^{NS}
Lungs (%)	0.01	0.01	0.01	0.02	0.01	0.05 ^{NS}
Pancreas	0.00	0.00	0.00	0.01	0.00	0.02 ^{NS}
Ceacal weight (%)	0.01	0.01	0.01	0.02	0.00	0.06 ^{NS}
Ceacal length (cm)	1.05	1.08	1.17	0.86	1.14	4.09 ^{NS}
Small Ints. Weight (g)	0.07	0.06	0.07	0.08	0.07	0.25 ^{NS}
Small Ints. Length (cm)	5.7	5.70	6.20	5.77	5.75	8.41 ^{NS}
Large Ints. Weight (%)	0.00	0.00	0.00	0.00	0.00	0.02*
Large Ints. Length (cm)	0.28	0.34	0.30	0.28	0.31	0.75 *
Abdominal Fat (%)	0.03	0.02	0.01	0.02	0.01	0.19 ^{NS}
Heart (%)	0.01	0.00	0.01	0.00	0.00	0.03*
Spleen (%)	0.00	0.00	0.00	0.00	0.00	0.02 ^{NS}

a,b,c = means within the same row bearing different superscript differ significantly (P<0.05)
SEM = Standard Error Means
NS = Not Significant
***** =Significant

V. Conclusion

This study has demonstrated that Rice milling residue can be utilized as a fibre source in broiler diets to replace wheat offal up to 100% inclusion level with better results in carcass characteristics of broiler chickens.

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