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Benefits/Economy of Production of Broiler Chickens Fed Rice Milling Residue

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Abstract

The benefits/economy of production of using Rice Milling Residue (RMR) to replaced Wheat Offal (WO) as a fibre source in broiler chicken diets were evaluated in an eight (8) weeks feeding trials. A total of three hundred (300) day old Anak white strain unsexed broiler chicks which were randomly allocated to five (5) dietary treatments of sixty (60) birds per treatment and replicated three (3) times with twenty (20) birds per replicate in a Completely Randomized Design (CRD). Five experimental diets formulated with RMR replacing WO at 0%, 25%, 50%, 75% and 100% designated as treatments T1, T2, T3, T4, and T5 respectively. The Average Daily Feed Intake (ADFI), Average Daily Weight Gain (ADWG) ad Feed Conversion Ratio (FCR) were not significantly different (P>0.05) across all dietary treatments. Results showed that T3 recorded the highest cost of feed intake (N773.73) per bird/kg and almost the least weight gained while T5 recorded the least feed intake (N712.72) per bird/kg and the highest weight gained (1.89 g) per bird/kg. The cost saving was better in T5 (N38.01) saved for every kilogram (kg) of feed formulated and least in T3 (-N34.52) meaning a loss or spending N34.52 above the control treatment over every kg of feed formulated. Revealing that it is of great economic benefit to replace WO with RMR as a fibre source up to 100% inclusion level.

Keywords: Animal protein; Poultry; Broilers

Introduction

Nigerians are faced with a shortage of animal protein supply due to some problems like the current economic situation, lack of a modern system of production and the most importantly high cost of feed which account for about 70%-80% of the total cost of producing broilers and eggs type chickens [1,2]. The high cost of poultry feed results in a general increase in the cost of production and hence affects the profitability of the poultry industry.

Adegbola reported that Nigerian consumed less than one-quarter of the protein required for normal metabolic body process [3]. F.A.O reported that the recommended daily consumption of animal protein should be 56 g per day per person, but unfortunately, Nigerians cannot meet this requirement due to the high cost of these products [4]. Christopher et al. reported that Nigerians consume only 15 g of animal protein per day [5].

The main problem confronting livestock producers in Nigeria today is the unavailability and high cost of the conventional feed ingredients. Prohibitive increase in the cost of inputs especially that of feed is among the major constraints in commercial broiler production. The increasing demands for feed ingredients as industrial raw materials is not only aggravating the poor situation but pushing the market prices of the conventional feed ingredients to alarming heights [6]. The composition between human and livestock for some common feed raw materials worsen the feed situation generally for livestock and mostly for monogastric [7]. The poultry producers will then ask "what is the way out? The production of low priced high-quality safe feed may be seen to be a way out"[7]. To arrest this problem, research efforts are been geared towards sourcing for unconventional agro-industrial by-products that may replace or supplement the conventional one [8,9]. Thus, improvement and sustainable growth of poultry production entail alternative feed resources which must be safe, cheap, abundant and not in competition with other demands. Hence, the need to explore other non-conventional, farm or industrial by-products those are locally available and relatively cheaper.

The aim of every farmer is to have the best product at minimum cost thereby maximizing profit. For Nigerian and developing countries poultry industry to be competitive, there is a need to reduce the cost of production through an effective search for alternative feed resources. Umoren at el; asserted that for a feedstuff to qualify as an alternative, the ingredients must be cheap, readily available and not used as a stable food for man but should meet the nutritional requirements of farm animals [10]. Hence the focus on RMR in this study. It was, therefore, the objective of this study to determine the cost benefits/economics of production of broiler chickens in response to the dietary level of Rice Milling Residue (RMR) replacing Wheat Offal (WO) as a fiber source in broiler chicken diets.

Rice milling residue (RMR)

Rice milling residue (RMR) also known as Rice Offal or Rice milling waste, is the by-product obtained from small-scale rice mills that process parboiled rice. Dafwang and Shwarmen reported that RMR contains the husk, grain polishing and small qualities of broken grains [11]. Wudiri estimated that small-scale rice mills process over 80% of the rice produced in Nigeria and that rice offal makes up 40% of parboiled rice, Nigeria, therefore, has the potentials to produce 200,000 metric tonnes of rice offal from the 500,000 metric tons of rice produced in Nigeria annually [12]. It is obtained at no extra cost or most often gives away price since they are produced all year round and usually discarded as a waste product. Most often it is burnt off to reduce environmental nuisance and pollution. In spite of the abundance of rice offal, it has been neglected as animal feed because of its high level of fiber and low protein and energy [13].

Materials and Methods

Location of study

The study was carried out at the poultry unit of the Research Farm of Taraba State College of Agriculture, Ardo-Kola Local Government Area of Taraba State in the North-East geopolitical zone of Nigeria. It lies between latitude 8050" North and longitude 110 23" East of the equator in the Guinea Savannah zone [14]. There are two main seasons existing in the area of study-dry and rainy seasons. It has an annual rainfall of 100-1500 mm with a temperature range of 30°C-42°C depending on the season [14]. The State is characterized by a tropical climate.

Experimental stock and management

Three hundred (300) day old Anak white mixed sex broiler chicks were used for the study. The chicks were brooded together on a deep litter management system for a period of one (1) week during which commercial feed and water were provided ad libitum. Similarly, all necessary management practices were strictly adhered to.

Experimental diets and design

Five (5) experimental diets were used for the study. The 5 dietary treatments of sixty (60) birds per treatment designated T1, T2, T3, T4, and T5. Each treatment has three (3) replicates of twenty (20) birds. Diets were formulated in which RMR replaced WO at 0, 25, 50, 75 and 100% for T1, T2, T3, T4, and T5 respectively with T1 serving as a control. A conventional poultry house with deep litter floor pens was used with treatment arranged in a Completely Randomized Design (CRD). Feeding trials lasted for eight (8) weeks with feed and water supplied adlibitum.

The composition of experimental diet for broiler starter diets

The ingredient composition of broiler finisher diet is presented in **(Table 1).** It comprises 48.59% maize and 32.01% soybean across the treatment groups. There was inclusion of WO at 100%, 75%, 50%, 25%, and 0%, while RMR had an inclusion level of 0%, 25%, 50%, 75% and 100% for T1, T2, T3, T4 and T5 respectively. All other ingredients were the same across treatment diets.

Table 1: Ingredients composition of broiler starter diets (1-4 weeks).

Levels of replacing of WO with RMR (%)					
Ingredient	(0%) T1	(25%) T2	(50%) T3	(75%) T4	(100%) T5
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	2.5	0
Rice Milling Residue	0	2.5	5	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

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Total Calculated analysis	100	100	100	100	100
Crude Protein	23.05	22.98	22.91	22.84	22.77
ME/kcal/kg energy	2909.37	2929.3	2949.37	2969.37	2989.37
Crude fibre (%)	3.3	3.63	3.59	3.53	3.68
Calcium (%)	1.55	1.58	1.55	1.55	1.56
Phosphorous (%)	0.9	0.92	0.93	0.95	0.97
Lysine (%)	1.64	1.63	1.62	1.61	1.6
Methionine (%)	0.41	0.52	0.41	0.42	0.42

*Vitamin-mineral premix provider per kg the following: Vit. A 1500 IU; Vit. D3 3000 IU; Vit E 30 IU; Vit. K 2.5 mg; Thiamine B1 3 mg; Riboflavin B2-6 mg; Pyridoxine B6 4 mg; Niacin 40 mg; Vit. B12 0.02 mg; Pantothenic acid 10 mg; Folic acid 1 mg; Biotin 0.08 mg; Chloride 0.125 mg; Mn 0.0956 g; Antioxidant 0.125 g; Fe 0.024 g; Cu 0.006 g; 10.0014 g; Se 0.24 g; Co 0.240 g.

Ingredients composition of experimental broiler finisher diets

The ingredients composition of experimental broiler finisher diets is presented in **(Table 2).** It comprises 55.16% maize and 25.44% of soya bean across the entire treatment groups. The inclusion levels of WO and RMR was as obtained in starter diet. Likewise, all other ingredients composition is the same across the entire treatment groups. The calculated Crude Protein (CP) was 20% across the entire treatment groups, while metabolizable energy ranges between 2929.08-3008.08 ME/Kcal/kg.

Table 2: Composition of broiler finisher diets (5-8) weeks.

Levels of replacing of WO with RMR (%)					
Ingredient	(0%) T1	(25%) T2	(50%) T3	(75%) T4	(100%) T5
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	2.5	0
Rice Milling Residue	0	2.5	5	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 Calculated analysis	100	100	100	100	100
Crude Protein	20	20	20	20	20
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	1.4	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. D3 3000 IU; Vit. E 30 IU; Vit. K 2.5 mg; Thiamine B1 3 mg; Riboflavin B2¬ 6 mg; Pyridoxine B6 4 mg; Niacin 40 mg; Vit. B12 0.02 mg; Pantothenic acid 10 mg; Folic acid 1 mg; Biotin 0.08 mg; Chloride 0.125 mg; Mn 0.0956 g; Antioxidant 0.125 g; Fe 0.024 g; Cu 0.006 g; 10.0014 g; Se 0.24 g; Co 0.240 g.

Proximate analysis

Proximate analysis of the experimental diets (starter and finisher) was carried out to determine the Dry Matter (DM), Crude Protein (CP), Crude Fiber (CF), Ether Extract (EE), Nitrogen Free Extract (NFE) and Ash content using procedure outlined by AOAC [15].

Statistical analysis

All data generated were subjected to one-way analysis of variance (ANOVA) in a Completely Randomized Design (CRD) according to Steel and Torrie [16]. Differences between treatment means were compared using Duncan Multiple Range Test (DMRT) [17].

Results and Discussion

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

The proximate composition of RMR is presented in Table 3. The Crude Protein (CP) of 8.75% higher than 6.2% reported by Obeka [18] and lower than 13.50% reported by Bata and Dale that may be attributed to different processing methods [19]. However, it falls within the range of 6.72-10.03% reported by Ambashankar and Chandrasekan [13]. The CF of 36.99% is in line with 37.60% reported by Obeka [18]. The Ash content of 20.12% also reported by Oyeyiola [20]. EE of 5.14% also agreed with 5.52% and 5.01% reported by Obeka and Oyeyiola respectively [18,20]. NFE level of 25.66% is lower than 30.54% reported by Obeka and higher than 23.38% reported by Oyeyiola [18,20].

Proximate composition of the experimental starter and finisher diets

The proximate composition of the experimental starter and finisher diets is presented in **Table 4**. The starter CP ranged between 23.25%-23. 81% falls within the recommended value of 22%-24% by Olomu [21]. Also agreed with Alaku that young growing poultry requires greater levels of protein than an adult, the CP value of finisher diet ranges between 20.02%-20.25% [22]. It is within the range of 19.67%-20.36% reported by Akinimutimi [23] and also in agreement with the recommended 20% protein requirement by Firman [24]. The CF values of 2.80%-50.05% were recorded in both starter and finisher phases. The crude fiber value is within the recommended values of 3.0%-6.0% by Olomu [21]. The proximate analysis result shows that the diets were similar and met the recommended nutrient requirements of poultry chickens.

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	23.3	20.25	20.16	20.02	20.1	20.31
Crude Fibre (%)	2.8	3.63	3.92	4.58	5.05	2.81	3.64	3.6	3.39	3.5
Ash (%)	4.06	2.97	3	3.03	3.18	3.46	3.28	3.44	3.26	2.74
Ether Extract (%)	10.4	10.4	9.45	8.52	13.71	7.59	8.79	9.1	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	58.7

Table 5 shows the economics of production of broiler chickens fed RMR as a partial replacement of WO. The values of total feed intake per bird/kg are 5.18, 5.22, 5.55, 5.37 and 5.36 kg/bird for T1, T2, T3, T4, and T5 respectively. T3 recorded the highest cost of total feed intake of N773.73 per bird/kg followed by T1 (N755.50 and the least in T5 (N712.72) per bird/kg. T3 had the highest cost of feed intake (N773.73) and least weight gained of 1.72 kg/bird. It must be noted that T5 recorded the highest weight gained (1.89 g) despite the fact that it recorded the least feed intake, that is a huge economic advantage over the rest. The feed cost (N/kg) was also least in T5 and highest in T3. The cost saving (N/kg) was also better in T5 (N38.01) and least in T3 (-N34.52). That means N34.52 spent above the control diet (T1) for every kg of feed formulated whereas N38.01 gained on T5 for the same quantity of feed formulated. The cost saving was negative in T3 and T4 since it is the cost of total feed intake divided by weight gained subtracted from the control (T1).

The economic analysis of the production of broiler chickens fed RMR as a partial replacement of WO as a fiber source is affected by the level of replacement since there is a relationship between the cost of total feed intake, total weight gain and feed cost. The use of RMR as a fiber source instead of WO has resulted in cost savings of N38.01 for every kg of feed formulated. This agreed with Abu et al. that feeds cost decreased with increased levels of rice offal inclusion [25]. Rice offal inclusion generally leads to a reduction in feed cost. Yakubu et al. also observed that treatment of rice offal with urea also leads to an economic advantage as inclusion reduces the cost of production [26]. Although RMR was not used as a major ingredient in this study, it's economic benefits can be very huge in a large scale commercial farm. The result shows that T5 (100%) RMR as a fiber source leads to least feed intake and highest weight gain leading to huge economic advantage/ benefits.

Table 5: Economics of production of broiler chickens fed RMR as partial replacement to WO.

Levels of replacement of WO with RMR (%)					
Parameters	0%	25%	50%	75%	100%
Total Feed Intake (Kg/bird)	5.18	5.22	5.55	5.37	5.36
Feed Cost (N/kg)	145.85	142.63	139.41	136.19	132.97
Cost of Total Feed Intake (N/kg)	755.5	744.53	773.73	731.34	712.72
Total Weight gain (kg)	1.82	1.87	1.72	1.69	1.89
Feed Cost (N/kg gain)	415.11	398.14	449.73	432.75	377.1
Cost Saving (N/kg gain)	-	16.97	-34.52	-17.64	38.01

Conclusion and Recommendation

The use of RMR as a fiber source up to 100% inclusion level resulted in less feed intake and highest weight gained which ultimately led to huge cost benefits/savings. Based on this study, it is recommended that farmers should be encouraged to use RMR as a fiber source for broiler production.

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