GROWTH PERFORMANCE OF BROILER CHICKENS FED ENZYME SUPPLEMENTED PLANTAIN PEEL MEAL DIET

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Abstract

This study was carried out to examine the performance of broiler chickens fed enzyme supplemented unripe plantain peel meal diet. A total of 150-day old broiler chicks were used for the study. They were assigned to five treatment groups with 3 replicates of 10 birds each in a Completely Randomized Design (CRD). The test diets were designated as T_1, T_2, T_3, T_4, and T_5 having 0%, 15%, 30%, 45% and 60% of dried unripe plantain peel meal supplemented with 0.05g/kg of enzyme which replaced a percentage of the maize in the control (T_1) without enzyme supplementation. The experiment lasted for eight weeks. Proximate analysis of the unripe plantain peel meal was also carried out. Data were collected for performance parameters of the broiler chickens. The result of this study showed that the proximate composition of the plantain peel meal was 80.8% Dry matter, 7.44% Crude protein, 0.60% Ether extract, 16.26% Crude fibre, 2.30% Crude ash, and 73.36% Nitrogen free extract. There was significant difference ($P<0.05$) in the initial weight, feed conversion ratio, and mortality of the broiler chicken across the treatment groups. However, significant differences ($P<0.05$) were also observed in final weight, average weight gain, total feed intake and cost of feed consumed/bird. It was concluded that 45% unripe plantain peel meal with enzyme supplementation could replace maize in the diet of chickens.

Keywords: Broiler Chicken, Unripe Plantain Peel, Enzyme, Performance, Supplement

Description of Problem

(6), defined a broiler (*Gallus gallus domesticus)* as any chicken that is primarily raised for meat production. Broilers attain market weight between four and seven weeks of age, although slower growing breeds reach slaughter weight at approximately 14 weeks of age. According to (15) conventional poultry feedstuffs are expensive, and are mostly cereal based, that also compete favorably as human food. Hence, it is not readily available to meet the demand of poultry. This has motivated the need for several investigations to alternative feedstuffs that could meet the nutrient requirements of poultry that are cheaper and readily available (13). (14), reported that plantain peels which are often seen as some form of menace to the society, especially in areas where there are laws restricting the movement of ruminants, can serve as an alternative feedstuff for broilers. Dry matter analysis have shown that unripe plantain peels contain 6-10% protein, 6-12% ash, 2-6% lipids, 11-39% starch and 33-43% total dietary fibre TDF (11). Nevertheless, the digestive tract of broiler chickens does not support the proper breakdown of plantain pulp, leaves and peels in their raw form because of high moisture content, low energy and protein. However, the plantain pulp, leaves, and peels in their dried form contains higher energy density, and can meet the nutrient requirement of broiler chickens with adequate supplementation of minerals, vitamins, non-feed additives, and enzymes. It is vital to note that feed trials using plantain to formulate broiler chickens diet are few compared to other non-conventional feedstuffs with a similar profile (5). Enzymes can disintegrate plant cell walls, reduce feed particles, and catalyze protein and anti-nutritional factors (7). The activity of the enzymes goes on to make nutrients in the broiler diet readily available (Avila *et al.*, 2012). Thus, this study was carried out to evaluate the performance of broiler chickens fed enzyme supplemented plantain peel meal diet.

MATERIALS AND METHODS

Experimental Site

This study was carried out in the deep litter hover of the University of Port- Harcourt Teaching and Research Farm. The farm is located at latitude 4ºN and longitude 7ºE with an average temperature of 26.4ºC and mean annual rainfall of 2708mm.

Plantain Peels Processing

Unripe plantain peels were collected from a plantain chips factory; Benely Optimum Ventures Eleme, Rivers State, Nigeria. The unripe plantain peels were sorted out and washed clean with water. The plantain peels were oven dried at a temperature of 80ºC for two days, milled and subjected to proximate analysis. Proximate analysis for the unripe plantain peel was carried out using the AOAC method of 1990.

Experimental Birds, Management and Experimental Diet

A total of 150 day old broiler chicks were randomly assigned to five treatment groups with 3 replicates of 10 birds each in a Completely Randomized Design (CRD) after obtaining their weight. The test diet were designated as T_1, T_2, T_3, T_4, T_5 having 0, 15, 30, 45, and 60% of dried unripe plantain peel meal. The enzyme (Fullenzyme®) was supplemented at 0.05g/kg in the diet as shown in Tables 1 and 2.

Data Collection

The growth of the birds in response to the dietary treatments was examined by taking their pre-experimental body weights, followed by weighing on a weekly basis pre-feeding. Feed offered daily per bird was recorded and refusal was weighed and recorded to determine feed intake.

Data Analysis

All data collected were subjected to a one way analysis of variance (ANOVA). The Duncan's Multiple Range Test was used to separate treatment means where significant differences existed.

Table 1: Composition of Experimental Starter Diet

Parameters	T_1 (0% uppm)	T_2 (15%uppm)	T_3 (30%uppm)	T_4 (45%uppm)	T_5(60%uppm)
Energy (g/kg)	0.00	0.05	0.05	0.05	0.05
Maize	45.60	38..76	31.92	25.10	18.24
Uppm	0.00	6.84	13.68	20.50	27.36
PKC	10.00	10.00	10.00	8.95	8.90
Soya bean meal	23..00	23.00	24.00	25.00	25.00
Fish meal	5.00	5.00	5.00	5.00	5.00
Wheat bran	9.69	9.69	8.59	8.69	8.15
Palm oil	2.60	2.60	2.70	2.70	2.60
Bone meal	3.00	3.00	3.00	3.00	3.00
Methionine	0.04	0.04	0.04	0.04	0.04
Lysine	0.02	0.02	0.02	0.02	0.02
**VP Premix	0.25	0.25	0.25	0.25	0.25
Salt	0.80	0.80	0.80	0.80	0.80
Total	**100**	**100**	**100**	**100**	**100**
Calculated Nutrient	20.73	20.79	21.12	21.43	21.48
ME(Kcal/Kg)	2798.56	2791.99	2803.99	2801.08	2795.39
Ether Extract	5.84	5.63	5.50	5.24	4.92
Crude Fiber	5.07	5.25	5.37	5.48	5.62
Lysine	1.09	1.14	1.21	1.28	1.34
Methionine	0.42	0.47	0.53	0.59	0.65
Calcium	1.50	1.56	1.63	1.69	1.75
Available Phosphorus	1.04	1.04	1.04	1.05	1.05

*UPPM- Unripe plantain peel meal ***Vitamin and Trace mineral for each kg contained: Mn 40g, Fe 20g, Zn 18g, Cu 0.8g, 10.62g, Co 0.09g and Se 0.04g. Panthotenic acid 1.000,000 IU, Cholecalciferol 1000 IU, Quinines 0.8g, Thiamine 0.06g and Riboflavin 2.4g, Folic Acid 0.4g, Biotin 0.02g, Ascorbic acid 10.0g, Choline Chloride 120g, Zinc Bacitracin 80.0g, Avatec 30.0g, ME= Metabolizable Energy.*

Table 2: Composition of Experimental Finisher Diet

Parameters	T_1(0% uppm)	T_2 (15%uppm)	T_3 (30%uppm)	T_4 (45%uppm)	T_5(60%uppm)
Energy	0.00	0.05	0.05	0.05	0.05
Maize	53.60	45.11	37.52	29.48	21.44
Uppm	0.00	8.49	16.08	24.12	32.16
Palm kernel cake	7.00	7.00	7.00	7.00	7.05
Soya bean meal	18.60	18.60	18.60	17.50	17.20
Fish meal	5.00	5.00	5.00	5.00	5.00
Wheat bran	6.69	6.65	6.65	7.73	7.51
Palm oil	4.00	4.04	4.04	4.06	4.08
Bone meal	4.00	4.00	4.00	4.00	4.00
Methionine	0.04	0.04	0.04	0.04	0.04
Lysine	0.02	0.02	0.02	0.02	0.02
**V/T Premix	0.25	0.25	0.25	0.25	0.25
Total	**100**	**100**	**100**	**100**	**100**
Calculated Nutrient					
Crude Protein	18.47	18.54	18.58	18.37	18.38
ME (Kcal/Kg)	2984.02	2978.64	2971.35	2952.22	2950.03
Ether extract	7.22	7.00	6.77	6.58	6.38
Crude fiber	4.35	4.56	4.76	5.02	5.27
Lysine	0.96	1.02	1.08	1.12	1.17
Methionine	0.38	0.45	0.51	0.57	0.63
Calcium	1.84	1.92	1.99	2.07	2.14
Avail. Phosphorus	1.16	1.16	1.17	1.18	1.18

*UPPM – Unripe plantain peel meal

** *Vitmamin and Trace mineral for each kg contained:Mn 40g, Fe 20g, Zn 18g, Cu 0.8g, Co 0.09g, Se 0.04g. Pantothenic acid 1000 IU, Cholecalciferol* 1000 *IU, Quinines 0.8g, Thiamine 0.06g, and Riboflavin 2.4g, Folic acid 0.4g, Biotin 0.02g, Ascorbic acid 10.0g, Choline Chloride 120g, Zinc Bacitracin 80.0g, Avatec 30.0g, ME= Metabolizable energy.*

RESULTS AND DISCUSSION

Table 3 shows the result of the proximate composition of the unripe plantain peel with 80.8% Dry matter, 7.44% Crude protein, 0.6% Ether extract, 16.26% Crude fibre, 2.30% Crude ash, and 73.36% Nitrogen free extract. This result did not tally with the results obtained for the proximate composition of plantain peel meal according to (11) except for crude protein (7.44%) which was within the 6-10% reported by the authors. The variations observed in the proximate composition of plantain peel meal is possibly due to factors such as the stage of maturity of the unripe plantain peels, heat treatment and the mixture of various varieties of the plantain peel. (1), reported that samples of plantain peels were very high in carbohydrate content and can be good sources of energy for the animals. This in agreement with the findings of this study. This is an indication that the unripe plantain peel meal is an energy rich feed. Thus, it is suitable to be used as broiler feed.

Table 3: Proximate composition of unripe plantain peel meal (% Dry matter basis)

Composition	Percentage
Dry matter	80.80
Crude protein	7.44
Ether extract	0.60
Crude fibre	16.26
Crude ash	2.30
Nitrogen free extract	73.36

Table 4 shows the effect of the diet on performance of the broiler chickens. The result for final weight showed that T_2-T_5 was significantly higher ($P<0.05$) than the control. The average weight gain of the broiler birds were significantly higher ($P<0.05$) when the birds were

fed diets T_2, T_3, T_4 than the control and T_5 which were lower. Total feed intake of the broiler birds was significantly higher ($P<0.05$) for birds fed T_1, T_2 and T_3 diets, while T_4 and T_5 recorded the lowest values. The value obtained from the present study showed no significant difference ($P>0.05$) in the feed conversion and mortality of the broiler birds across the treatment groups. The cost of feed consumed/bird was significantly higher ($P<0.05$) for T_5, when compared to other treatment groups. This result agreed with the report of (12), that there was significant increase in the final weight of the broiler chicken when plantain peel meal was fed as replacement for maize in the broiler diet. The result for weight gain from the present study also agrees with the report of (9) who reported that weight gain showed significant increase in the 10% replacement of maize with unripe plantain peel in the diet. Daily feed intake of the broiler chicken is influenced by a host of factors which include physiological (10), to particle size. The daily feed intake of the broiler birds from the present study was higher ($P<0.05$) in T_1, T_2 and T_3 when compared to T_4 and T_5, and could be attributed to the higher quantity of maize in T_1, T_2, T_3. This agrees with the report of (12) that feed intake of the broiler birds increased in the diet with a higher quantity of maize. However, this is not in agreement with the findings (2) who revealed that feed intake declined across treatment groups of broiler chickens fed plantain peel meal diet. This variation in previous research might be due to difference in inclusion levels of the plantain peel meal in the diet, and also, the difference in processing methods of the plantain peels before feeding was carried out.

Table 4: Effect of diet on the performance of broiler chicken

Parameters	Treatment					SEM
	T_1	T_2	T_3	T_4	T_5	
	(0%)	(15%)	(30%)	(45%)	(60%)	
Initial weight (g)	43.36	45.60	45.30	44.30	43.60	0.68
Final weight (g)	1608.6^b	1953.60^a	2190.30^a	2250.30^a	1826.60^a	126.2
Average weight gain/bird (g)	1565.00^b	1908.00^a	2145.00^a	2160.70^a	1783.00^b	50.80
Total feed intake/bird/kg	3495.00^a	3417.00^a	3331.00^a	3152.00^b	2879.00^b	61.81
Feed conversion ratio	2.23	1.79	1.55	1.46	1.61	0.12
Mortality (%)	0.13	0.10	0.10	0.10	0.16	0.22
Cost of feed consumed /bird(N)	736.63^b	739.53^b	731.25^b	740.86^b	767.04^a	3.61

[a,b] Means with different subscript within the same row are significantly different ($P<0.05$)
SEM – Standard Error of Mean

Conclusion and Application

- The proximate composition of the unripe plantain peel proved that it could be grouped as a non-conventional energy feed source for broilers.
- The improved performance of the birds observed in this study clearly pointed out that plantain peels can replace maize in broiler diet.
- 45% inclusion level as replacement for maize is appropriate in the broiler feed.

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