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Growth performance of broilers fed graded levels of full fat palm fruit meal diets with or without enzyme

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Target audience: Poultry farmers, Animal scientists, Nutritionists, Livestock Extension workers

Abstract

A study was conducted to evaluate the effect of feeding graded levels of full fat palm fruit meal (FFPFM) with or without Maxigrain enzyme on the growth performance of broilers. A total of 180 day-old chicks of Hubbard F15 strain were assigned to 12 experimental diets (6 with enzymes and 6 without enzyme inclusion) in a completely randomized design. The birds were fed graded levels of 0, 10, 20, 30 40 and 50% of FFPM as partial replacement for maize. Data was recorded for feed intake (g/day), weight gain (g/day), and feed efficiency. The study lasted for 56 days. Birds fed 40% FFPFM (with and without enzymes) performed better (P<0.05) in feed intake (486.51 g/d and 434.73 g/d, respectively) when compared to others. In terms of weight gain, birds fed 40% FFPFM (with enzymes) and 50% FFPFM (without enzyme) (33.98 g/d and 34.21 g/d) performed better (P<0.05). The feed efficiency was however best at 40% FFPFM inclusion for both enzyme and without enzyme inclusion (0.07). Thus, a 50% level of FFPFM supplementation in the diets of broilers with or without enzymes fortification can be tolerated without any adverse effect on their growth performance.

Keywords: Full fat palm fruit meal, enzyme, broiler chickens, growth performance.

Description of Problem

Animal production industry is geared towards converting cheap and available feedstuffs into a more balanced animal protein. Feed accounts for over 75-80% of the total cost of production (1), and its insufficiency is due to stiff competition for feedstuffs between human and livestock (2). A search for alternative feedstuffs that are readily available, cheap and nutritive becomes imperative in order to sustain the livestock industry particularly the fast growing and prolific monogastric species.

Palm fruit meal (PFM) is one of such alternative (non conventional) feedstuffs and is a product of whole palm kernel fruit milling. Palm fruit meal has been used both as protein and energy sources in laying hens (3, 4), broilers (5), rabbits (6), sheep and goats (7) and cattle (8). Akpodiete *et al.* (9) showed that PFM could replace up to 60% of protein in groundnut meal in diets of broilers, pullet chicks and growers thereby permitting incorporation of 28-38% of PFM. The crude protein content and gross energy ranges are 18.50 – 21.35% and 4.28 – 4.99 kcal/g, respectively (10).

Boateng *et al.* (11) observed that feeding PFM up to 40% to broilers, depressed body weight gain and feed efficiency at levels beyond 30% and the reason adduced for this observation was reduction of dietary energy,

and grittiness of such diets resulted in reduced feed intake (12, 13). Armas and Chicco (2000) (14) observed that the material (PFM) was fibrous, hence increase in the levels resulted in depressed digestibility of other nutrients in the diets. This study was thus conducted to determine the growth performance of broilers fed with full fat palm fruit meal diets with or without enzyme supplementation.

Materials and Method

Location

The experiment was conducted in poultry farm within the same community where the permanent site of the University of Uyo is located (Main Campus). The farm name is "Hatch Your Own" located at Ekamba Nsukara Offot, Uyo Local Government Area of Akwa Ibom State.

Experimental Design/Layout

Research was carried out using a completely randomized design. A total of one hundred and eighty (180) broilers chicks of Hubbard F15 strain were used. There were twelve (12) treatments each having three (3) replicates. Each treatment had fifteen (15) birds with five (5) birds per replicate. The two trials were carried out side by side.

Sources and processing of Experimental Materials

Ripe, fresh and selected palm fruits were purchased at Domita Farms and from local farmers in Uyo Local Government Area. Other micro and macro ingredients were purchased from Ibadan. Palm fruit was processed into meal with aid of a hammer mill situated in the farm. This was done after the fruits had been separated from the bunch.

Experimental Diets

Twelve experimental diets were formulated at the broiler finisher stage. Six (6) diets were formulated with enzyme inclusion and the other six without enzyme inclusion in diets. Treatment one (T1) was control diet with no inclusion of full fat palm fruit meal (FFPFM) and enzyme. Treatment two (T2) had 10% FFPFM while T3, T4, T5 and T6 had 20%, 30%, 40% and 50%, respectively of FFPFM with or without 2.50 grams of Maxigrain enzyme per 25kg (100g/tonne) of feed which had Xylanase 10000 IU, Beta glucanase 200 IU, Cellulase 10000 IU, and Phytase 2500 FTU. These are shown in Tables 1 and 2.

Table 1: Ingredients composition of experimental starter diets with or without enzyme

Ingredients	T1 (0%)	T2 (10%)	T3 (20%)	T4 (30%)	T5 (40%)	T6 (50%)
Maize	58.45	48.45	38.35	28.45	16	13
Soyabean meal	32.30	32.20	32.20	32.20	34.65	30.35
Palm fruit meal	0	10	20	30	40	50
Fish meal	5	5	5	5	5	5
Bone meal	3.45	3.45	3.45	3.45	3.45	3.45
Table salt	0.20	0.20	0.20	0.20	0.20	0.20
DL-Methionine	0.25	0.25	0.25	0.25	0.25	0.25
TM/Vit Premix*	0.25	0.25	0.25	0.25	0.25	0.25
L-Lysine	0.20	0.20	0.20	0.20	0.20	0.20
Total	100	100	100	100	100	100
Calculated Nutrient composition						
Crude protein	23.81	23.36	23.54	23.64	23.81	23.21
Crude fibre	3.74	4.80	5.87	6.94	7.94	8.90
Ether extract	3.85	8.92	13.99	19.07	24.04	29.40
ME (Kcal/kg)	2931.06	3226.14	3518.51	3819.74	4032.49	4569.50

Maxigrain enzyme = 100g/tonne of feed

*Premix to provide the following per kg of feed: vitamin A, 12,000,00 IU; vitamin D3, 2,500,00IU; vitamin E, 20,000iu; vitamin K3, 2000mg; vitamin B1, 2000mg; vitamin B2, 5000mg; vitamin B6, 4000mg; vitamin B12, as Niacin, 30000mg; pantothenic acid, 11000mg; folic acid, 1500mg; biotin, 60mg; choline chloride, 220,000mg; antioxidant, 1250mg; manganese, 50,000mg; zinc, 40,000mg; iron, 20,000mg; copper, 3000mg; iodine 1000mg; selenium, 200mg; cobalt, 200mg.

Table 2: Ingredients composition of experimental finisher diets with or without enzyme

Ingredients (%)	T1 (0%)	T2 (10%)	T3 (20%)	T4 (30%)	T5 (40%)	T6 (50%)
Maize	68.74	59.34	52.50	43.10	33.71	24.31
Soyabean meal	20.26	19.66	16.50	15.90	15.29	14.69
Palm fruit meal	0	10.00	20.00	30.00	40.00	50.00
Fish meal	5.00	5.00	5.00	5.00	5.00	5.00
Bone meal	5.00	5.00	5.00	5.00	5.00	5.00
Salt	0.20	0.20	0.20	0.20	0.20	0.20
Methionine	0.25	0.25	0.25	0.25	0.25	0.25
Premix*	0.25	0.25	0.25	0.25	0.25	0.25
L-Lysine	0.25	0.25	0.25	0.25	0.25	0.25
Total	**100**	**100**	**100**	**100**	**100**	**100**
Nutrient composition (calculated)						
Crude protein	19.00	19.00	18.00	18.00	18.00	18.00
Crude fibre	3.24	4.28	5.23	6.28	7.32	8.37
Ether extract	3.84	8.92	14.01	19.08	24.16	33.87
ME (Kcal/kg)	2993.55	3296.42	3625.20	3928.07	4231.05	4533.92

Maxigrain enzyme = 100g/tonne of feed

*Premix to provide the following per kg of feed: vitamin A, 12,000,00 IU; vitamin D3, 2,500,00IU; vitamin E, 20,000iu; vitamin K3, 2000mg; vitamin B1, 2000mg; vitamin B2, 5000mg; vitamin B6, 4000mg; vitamin B12, as Niacin, 30000mg; pantothenic acid, 11000mg; folic acid, 1500mg; biotin, 60mg; choline chloride, 220,000mg; antioxidant, 1250mg; manganese, 50,000mg; zinc, 40,000mg; iron, 20,000mg; copper, 3000mg; iodine 1000mg; selenium, 200mg; cobalt, 200mg.

Management

The birds were raised on deep litter system using wood shavings, which were spread on the floor. Adequate sanitary measures were taken; wood shavings were changed duly, depending on wetness. Feeding troughs, drinkers and other equipment necessary for raising of the birds were properly cleaned daily. Feed and clean water was given *ad-libitum* throughout the experimental period. Vaccinations were administered at the required time.

Data Collection

Feed intake was recorded daily while live weight was measured on weekly basis.

Statistical Analysis

All data collected were statistically analyzed using the analysis of variance procedure of (15) and significant differences between treatment means were assessed by Duncan's multiple range tests.

Results and Discussion

The growth performance of broiler chickens fed full fat palm fruit meal diets with enzyme are as shown in Table 3.

Table 3: Growth performance of broiler chickens fed FFPFM diets with enzyme

Parameter	T1	T2	T3	T4	T5	T6	SEM
Initial body weight (g)	40.75	40.75	40.75	40.75	40.75	40.75	0.90
Daily feed intake (g/d/bird)	176.40^{d}	245.45^{c}	303.05^{c}	406.55^{b}	486.51^{a}	395.86^{b}	20.69
Daily body weight (g/d)	28.14^{ab}	22.07^{b}	27.84^{ab}	30.11^{ab}	33.98^{a}	31.06^{ab}	2.70
Final body weight (g)	1616.70^{ab}	1276.70^{b}	1600.00^{ab}	1726.70^{ab}	1943.30^{a}	1780.00^{ab}	151.48
Feed efficiency	0.16^{a}	0.09^{b}	0.09^{b}	0.08^{b}	0.07^{b}	0.08^{b}	0.01

^{ab}Means with different superscripts are significantly different ($p<0.05$) within the rows
FFPFM - Full fat palm fruit meal

The highest daily feed intake (486.51 g/day/bird) was obtained for broiler fed diets with 40% FFPFM with enzyme which was significantly higher than those on control diet (176.40 g/day/bird) without FFPFM, also for those on T2, T3, T4 and T6 (245.45, 303.05, 406.55 and 395.86 g/day/bird respectively). The intake of feed increased as the FFPFM level increased, from T1 – T5, but decreased for those on T6. Increase in intake across the treatments may be due to higher metabolizable energy content of the diets and presence of enzymes. High energy feeds are noted to occasion high intakes especially if they are not adequate (5). Apart from this, the increase may be attributed to faster degradation of non starch polysaccharides by action of the enzymes or faster passage rate of the fruit meal digested.

The values for total weight gain, daily weight gain and final body weight of the broiler ranged from 1525.90g – 1902.60g, 22.07g – 33.98g and 1276.70g – 1943.30g respectively. For all the parameters afore-mentioned, broilers on T5 performed better ($P<0.05$) than those on T2. However, birds on control (T1) did not perform differently ($P>0.05$) to those fed FFPFM diets fortified with enzyme (T2, T3, T4, T5 and T6 diets). The result obtained here is in agreement with the report of (16) who stated that increased energy consumption promotes better weight gain. The birds fed enzyme (T4, T5 and T6) were numerically heavier than control. Moreover, another reason for this increase, numerically over the control, as reported by (17), is that the improvement in digestibility by including enzyme might result in better nutrient absorption. The feed efficiency varied

significantly (P<0.0) across the treatment with birds on T5 having the best value and thus could be observed in the final body weight and change which may be due to enzyme fortification.

The performance in terms of growth of broilers chickens fed full fat palm fruit meal diets without enzyme is presented in Table 4.

Table 4: Growth performance of broiler chickens fed full fat palm fruit meal without enzyme

Parameter s	T1	T2	T3	T4	T5	T6	SEM
Initial body weight (g)	40.75	40.75	40.75	40.75	40.75	40.75	0.09
Daily feed intake (g)	123.20^{d}	116.11^{d}	227.40^{c}	345.37^{b}	434.73^{a}	373.45^{b}	16.56
Total weight gain (g)	1859.30^{a}	1759.30^{ab}	1502.60^{b}	1769.30^{ab}	1822.60^{a}	1915.90^{a}	87.49
Daily body weight (g/d)	33.20^{a}	31.42^{ab}	26.83^{b}	31.59^{ab}	32.55^{a}	34.21^{a}	1.56
Final body weight (g)	1900.00^{a}	1800.00^{ab}	1543.30^{b}	1810.00^{ab}	1863.30^{a}	1956.70^{a}	87.49
Feed efficiency	0.28^{a}	0.27^{a}	0.12^{b}	0.09^{b}	0.07^{b}	0.09^{b}	0.02

^{ab}Means with different superscripts are significantly different (P<0.05)

Birds fed T5 recorded the highest daily feed intake (434.73 g/bird/day), which was significantly higher than other treatments. The least value was obtained for birds on T2 (116.11 g/bird/day), which was similar (P>0.05) with control T1 (123.20 g/bird/day). Birds on T6 recorded a lowered (P<0.05) intake when compared with those on T6 but similar to those on T4. These observations agree with findings of (10) who stated that feed intake of birds fed palm kernel meal based diet was usually higher than that of maize-based diets.

The total weight gain (TWG) daily body weight gain (DBWG) and final body weight (FBW) values ranged from 1502.60 – 1915.90 g, 26.83 – 34.21 (g/d), and 1543.30 – 1956.70 g respectively. The values for birds on T1, T5 and T6 diets were significantly different (P<0.05) from those on T3 for all the weight parameters (TWG, DBWG and FBW) measured. From T1 – T3, the values decreased while from T3 – T6, the values tended to increase with increase in FFPFM in diets. The results obtained in this study is in agreement with report of (18) which stated that weight gain of poultry birds placed on palm kernel meal based diets with up to 40% replacement could compete favourably with that of maize-based diets.The feed efficiency was similar (P>0.05) for birds on T1 and T2 (0.28 and 0.27 respectively) but different from (P<0.05) those on T3 – T6 (0.07 – 0.12).

The weights from the non enzyme fortified diets were higher than those from the enzyme fortified diets.

Conclusion and Applications

The findings of this study showed that:

1. Feeding full fat palm fruit meal with enzyme up to 50% replacement level had no negative consequence on the performance of broilers.
2. Birds on treatment 5 (40% FFPFM with enzyme) provided the best value for body weight.
3. However, without enzyme inclusion in their diets, birds on treatment 6 (50% FFPFM) performed well though similar with those on treatment 5.
4. 40 – 50% FFPFM with or without enzymes can replace maize for efficient production in broiler production.

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