Nigerian J. Anim. Sci. 2018, 20 (4): 594-600

Carcass yield and internal organs of broilers fed graded levels of full fat palm fruit meal diets with and without enzyme

Essien, E. B., Enyenihi, G. E., and Inyang, U. A.

Department of Animal Science, University of Uyo, Nigeria

Corresponding Author: gloryenyenihi@yahoo.com; idarakang72@gmail.com, ***Phone No.:*** 08028259884

Target Audience: Poultry farmers, Researchers

Abstract

This study evaluated the effects of utilizing Full Fat Palm Fruit Meal (FFPFM) in two separate trials (i.e. with and without enzyme) on carcass yield and internal organs of broiler chickens. A total of one hundred and eighty (180) chicks of the Hubbard F15 strain were assigned to twelve experimental groups (i.e. six groups of with and six of without Maxigrain enzyme) in a completely randomized experimental design. The groups were: 0%, 10%, 20%, 30%, 40% and 50% of FFPFM as partial replacement for maize designated as T1, T2, T3, T4, T5 and T6 respectively. On day 56, birds were randomly selected from each treatment and slaughtered to evaluate the carcass yield and internal organs. The result showed that there were significant differences in dressing percentage (DP) in both trials. Birds on T4 diet performed best in DP (88.96% and 89.46%, respectively) in with and without enzyme fortified diets. There were significant differences (P<0.05) in organ weights of broilers in both trials except the pancreas and gizzard of birds without enzyme inclusion. The results obtained showed that full fat palm fruit meal can also replace maize up to 40 – 50% in broiler diet for efficient production.

Keywords: Broilers, carcass, enzyme, palm fruit meal

Description of Problem

Poultry industry as a major source of animal protein occupies a prominent position of supplies to the citizens in Nigeria (1). In developing countries, global trading of all meat products as well as feed and related inputs has led to a significant growth in poultry (especially broiler chicken) production and consumption (2).

According to (3), inadequate production of feed and inadequate capital production are the most important socio-economic constraints affecting broiler production in Nigeria. Feed represents the major cost of poultry production. The constraints are led by scarcity and high cost of feed ingredient such as maize and soyabean (4). Maize is the most commonly used energy source and the most predominant feed grain used in poultry feed (5). Dietary energy level is the main factor influencing feed intake, as birds under normal circumstances eat to satisfy their energy need. Since their energy requirement is high, a reduction in the cost of energy feed would translate to reduced cost of feeding livestock. Hence, the need to search for alternatives (6) to maize becomes imperative.

One of such energy alternatives is palm kernel fruit meal. According to (7) it can partially substitute maize to reduce cost of poultry feeds because it contains energy and fatty acid. The use of full fat palm kernel meal in the diet of broilers may offer some advantages on account of its fat content being a concentrated source of energy and a means of increasing the energy contents of diets (8, 9).

The addition of enzymes has shown to be beneficial in poultry diets (10). Enzymes are utilized in animal feeding to complement the enzyme insufficiently produced by the animal (amylases and proteases) and to provide animal those enzymes not synthesized by them (cellulase) (11). They have been shown to improve performance and nutrient digestibility when added to broiler diet containing maize (12).

Therefore this research was carried out to determine the effect of non-conventional feed ingredient, full fat palm fruit meal, on the carcass yield and internal organs of broiler chicken.

Materials and Methods

Experimental Site: The experiment was conducted in the poultry farm located at Ekamba Nsukara Offot, Uyo Local Government Area of Akwa Ibom state.

Experimental Birds and Materials: A total of one hundred and eighty (180) broiler chicks of Hubbard F15 were purchased from a reputable hatchery in the state. Ripe, fresh and selected palm fruits were purchased from Domita farms at Ekamba Nsukara Offot, Uyo, Akwa Ibom State, Nigeria. Other feed ingredients were also purchased from the main market (Akpan Andem Market) within Uyo Metropolis.

Processing of Experimental Materials: The processing of palm fruits meal was done with the aid of a hammer mill situated within the farm. Ingredients were individually measured as specified in the feed dietary formula and where necessary were ground individually and floor mixed using shovel and hands.

Experimental Diet: Twelve experimental diets were formulated at starter and finisher stages. Six diets were formulated with enzyme inclusion (as first trial) and the other six without enzyme inclusion in the diets (second trial) (see Table 1 and 2). In both trials and stages, treatment one (T1) was a control diet with no inclusion of palm fruit meal (FFPFM) and enzyme. Treatment two (T2) had 10% FFPFM, while T3, T4, T5 and T6 had 20%, 30%, 40% and 50% FFPFM, respectively with 2 grams of maxigrain enzyme per 25kg of feed (with enzyme inclusion). The experiment lasted for 56 days.

Data Collection

Live weight was done on weekly basis. At the eight week of the experiment, birds were randomly selected from each of the treatment and starved overnight to empty their crops. Before carcass analysis, the final body weight was taken before internal organ weight was measured.

The birds were slaughtered by severing the jugular vein, exsanguinated, scalded in warm water for about a minute, defeathered manually, eviscerated and dressed to determine carcass characteristics. Each part was separately weighed using sensitive electronic scale and expressed as percentage of dressed weight.

Statistical Analysis

All data collected were statistically analyzed using the analysis of variance procedure of (13) and significant differences between treatments means were assessed by Duncan's multiple range test of same package. The two trials were analyzed separately in a completely randomized design.

Results and Discussion

Table 3 presents the carcass characteristics of broiler finishers fed full fat fruit meal with enzymes. Full fat palm fruit meal with enzyme supplementation of birds on T3 (2.00), T4 (2.00) and T5 (2.00) recorded highest (P<0.05) dressed weight than those on T2 (1.40) and T1 (1.60). The dressing percentage was not significantly different (P>0.05) between birds on T3, T4, T5, T6 and T1 (control) (88.76, 88.96, 87.17, 85.98 and 86.40%, respectively). This observation is contrary to reports of (14) who reported that dressing percentage of birds linearly increased with increasing levels of energy content.

There was no significant difference (P>0.05) in the thigh, drumstick and wing and this is similar to reports by (15) who reported no significant difference for drumstick, wing and thigh.

The breast and back percentages was highest (P<0.05) for birds on T6 (24.03% and 17.03% respectively) while birds on T2 recorded the least values (14.86% and 12.58% respectively). This finding is in accordance to the reports of (16) and (17). They reported that the addition of enzymes in broiler diets elicited an increased breast meat yield. The neck percentage was highest (P<0.05) for birds on T4 (3.71%) which was significantly different from the other treatments. The least was recorded for birds on T3 (2.25%) which was similar to those on T1 and T2 (2.35% and 2.51% respectively). Birds on T6 recorded 3.17% which was different from other treatments.

Other factors noted to influence the development of breast, neck and back cut are gender, age, genetic factor and strains of chickens.

Table 4 shows that internal organs of broilers fed full fat palm fruit meal with enzyme supplementation. There was significant differences (P<0.05) in all the parameters measured. This finding was in accordance to findings of (18). They reported that high dietary energy levels in broiler feed may have caused significant differences in organ weights of broiler chicken. Birds on T2, T4 and T6 recorded highest (P<0.05) gizzard weight. The higher gizzard size may be related to the higher dietary fibre content (19).

Omojola and Adesehinwa (20) however reported that the inclusion of exogenous enzyme in diet of broilers did not affect the relative weight of gizzard, heart, liver and spleen. This assertion was contrary to our findings. The difference may be due to the different type of ration, nutrient content, bird breed, processing, environment and management conditions.

In the second trial, the birds fed FFPFM without enzyme recorded the highest final weight and dressed weight as shown on Table 5. Birds on T4, T5 and T6 recorded 2.15kg, 2.00kg and 2.00kg respectively and were significantly different from those on T1 (1.50kg). However, birds on T2, T3, T4, T5 and T6 were similar statistically. This finding is similar to reports by (18) who reported that the higher dietary energy resulted in higher final weight and dressed weight.

The dressing weight and dressing percentage of birds on T4 recorded the highest value of 1.93kg and 89.46% respectively but they were similar statistically with those on T2, T3, T5 and T6 (1.50kg, 1.60kg, 1.70kg, 1.70kg vs 83.61%, 84.26%, 84.73% and 85.03% respectively. The least (P<0.05) values were observed for birds on T1 (1.20kg vs 79.16kg).

Birds on T5 recorded the highest values for drumstick and wing (12.19% and 9.21%) while least were for those on T6 (8.82% and 7.35%). The highest value for breast was observed for birds on T4 (27.63%) while least was recorded for those on T1 (15.74%).

The internal organ weights of broilers fed full fat palm fruit meal without enzymes are presented in Table 6. There was significant differences (P<0.05) in the internal organ weights of broilers for all the parameters measured except for pancreas which was similar statistically (P>0.05) across treatments.

There is the likelihood that the high dietary energy levels resulting from increasing levels of FFPFM may have caused a significant difference in the internal organs. This finding is similar to reports (14). Birds on T2 recorded the highest ($P<0.05$) in heart, liver, spleen, caecum, gizzard and large intestine (0.94, 3.79, 0.27, 1.65, 3.94 and 1.61% respectively.

Conclusion and Applications

1. The inclusion of full fat palm fruit meal improved carcass characteristics and internal organs even up to 50%.
2. However, the use of full fat palm fruit meal can serve as an alternative source of energy for broiler production as evident from this study.

References

1. Atteh, J. O (2003). Problems of poultry industry. 68th Inaugural lecture. University of Ilorin. Published by Unilorin Press.
2. Landes, B. O., Lewis, P. and Curtis, S. E (2004). Advantages of poultry production of broilers selected for leanness. World's Poultry Science Congress, Amsterdam, 20:125-128.
3. Adeniyi, A. O (2000). Future trends in poultry production systems: behaviour, management and welfare. Wallingford CAB. International, Oxford, UK, pp. 238.
4. Taha, R (2003). Management and housing systems for broiler effects on welfare and production. *World's Poultry Science Journal*, 61:477-490.
5. Kellems, R. O. and Church, D. C (2010). Livestock Feeds and feeding. Boston Massachusetts, USA, Prentice Hall.
6. Kwari, I. D., Igwebuike, J. U., Bello, N., Rabo, S. J. and Birna, M (2004). Replacement of groundnut cake with sorrel seed meal in broiler finisher diets. Proc. 9th Annual Conference of Animal Science Nigeria, pp. 5-7.
7. Sundu, B., Kumar, A. and Dingle, J (2006). Palm kernel meal in broiler diets effect on chicken performance and health. *World Poultry Science Journal*, 62:316-325.
8. Salma, U., Miah, A. G., Mak, T., Nishimura, M. and Tsujii, H (2007). Effect of dietary fat on cholesterol concentration and fatty acid composition in broiler meet. *Poultry Science*, 86:1920-1926.
9. Pesti, G. M., Bakalli, R. I., Qias, M. and Sterling, K. G (2002). A composition of 8 grades of fat as broiler feed ingredients. *Poultry Science*, 81:382-390.
10. Soltan, M. A (2009). Growth performance, immune response and carcass traits of broiler chicks fed on graded levels of palm kernel cake without or with enzyme. *Livestock Res. Rural Development*, 21(3):107-110.
11. Fischer, G., Maier, J. C. and Rutz, F (2002). Influence of dietary enzymes complex on broiler performance in diets with and without antibiotic supplementation. *Enzymes in Animal Nutrition*, 31: 402-410.
12. Saleh, F. A., Ohtsuka, T. T. and Hayashi, K (2003). Effect of enzymes of microbial origin, in vitro digestibilities of dry matter and protein in maize. *Journal of Poultry Science*, 40: 274-281.
13. SAS (1999). Statistical Analysis System, SAS/STAT user's guide SAS institute Inc. Cary, North Carolina, USA.
14. Okeudo, N. J., Ndidi, K. U., Izugbekwe, V. and Akanno, E. C (2005). Growth rate, carcass characteristics and organoleptic quality of broiler fed graded levels of palm kernel cake. *International Journal of Poultry Science*, 4:330-333.

15. Mardhiti, M., Wong, H. K. and Noraini, S (2011). Growth performance and carcass quality of broiler fed with palm kernel meal-based rations. *J. Trop. Agric and Food Sc*. 39(2): 157-166.
16. Wang, Z., Qiao, S. Y., Lu, W. Q. and Li, D. F (2005). Effects of enzyme supplementation on performance, nutrient digestibility, gastro intestinal morphology and volatile fatty acid profiles in the hind gut of broilers feed wheat-based diets. *Poultry Science*, 84:875-881.
17. Alam, M. J., Howlider, M. A. R., Pramanik, M. A. H. and Haque, M. A (2003). Effect of exogenous enzyme in diet on broiler performance. *International Journal of Poultry Science*, 2:168-173.
18. Sese, B. T., George, O. S. and Agbovu, C. B (2014). Effects of graded levels of full fat palm kernel and meal on growth performance and carcass characteristics in broiler chicks. *Journal of Biology, Agriculture and Healthcare* 4(12): 19-28.
19. Onwudike, O. C (1986). Palm kernel meal as a feed for poultry. 3 replacement of groundnut cake by palm kernel meal in broiler diets. *Animal Feed Science and Technology* 16:195-202.
20. Omojola, A. B. and Adesehinwa, A. O. K (2007). Performance and carcass characteristics of broiler chickens fed diets supplemented with graded levels of Roxazyme G$^{(R)}$. *International Journal of Poultry Science*, 6(5): 335-339.

Table 1: Ingredients composition of Experimental starter diets (with or without enzyme)

Ingredients	T1	T2	T3	T4	T5	T6
Maize	58.45	48.45	38.35	28.45	16.00	13.00
Soyabean meal	32.20	32.20	32.20	32.20	34.65	30.35
Palm fruit meal	0.00	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	3.45	3.45	3.45	3.45	3.45	3.45
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
Lysine	0.20	0.20	0.20	0.20	0.20	0.20
Total	100.00	100.00	100.00	100.00	100.00	100.00
Nutrient Composition (calculated)						
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	2940
ME (Kcal/kg)	2931.06	3226.14	3519.51	3919.74	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	(0%) T1	(10% T2	(20%) T3	(30%) T4	(40%) T5	(50%) T6
Maize	68.74	59.34	52.50	42.10	33.71	24.31
Soyabean meal	20.26	79.66	16.50	15.90	15.29	14.69
Palm fruit meal	0.00	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	0.25	0.25	0.25	0.25	0.25	0.25
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
Lysine	0.25	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00	100.00
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

Table 3: Carcass characteristics of broilers fed full fat palm fruit meal with enzymes

Parameters	T1	T2	T3	T4	T5	T6	SEM
Final live weight (kg)	1.85^{ab}	1.70^{b}	2.25^{a}	2.25^{a}	2.30^{a}	2.10^{ab}	0.14
Dressed weight (kg)	1.60^{bc}	1.40^{c}	2.00^{a}	2.00a	2.00^{a}	1.80^{ab}	0.11
Dressed percentage (%)	86.40^{ab}	82.66^{b}	88.76^{a}	88.96^{a}	87.17^{ab}	85.98^{ab}	1.40
Thigh	11.18	10.47	10.51	9.75	11.28	10.31	0.58
Drumstick	11.19	11.56	10.79	10.66	10.23	11.10	0.63
Wing	8.46	7.91	8.04	8.03	8.06	7.38	0.43
Breast	15.39^{c}	14.86^{c}	18.85^{bc}	20.81^{ab}	16.67^{bc}	24.03^{a}	1.29
Back	13.14^{cd}	12.58^{d}	15.65^{b}	14.34^{c}	13.34^{cd}	17.03^{a}	0.42
Neck	2.35^{d}	2.51^{cd}	2.25^{d}	3.71^{a}	2.79^{c}	3.17^{b}	0.12

a,b,c,d means with different superscripts are significantly different (P<0.05)

Table 4: Internal organs of finisher broilers Chicken fed full fat palm fruit meal with enzymes

Parameters	T1	T2	T3	T4	T5	T6	SEM
Proventriculus	1.25^{a}	0.77^{c}	0.76^{c}	1.03^{b}	1.12^{ab}	0.60^{d}	0.05
Heart	0.87^{a}	0.46^{d}	0.73^{b}	0.59^{c}	058^{c}	0.61^{c}	0.03
Liver	3.28^{a}	2.58^{b}	3.11^{a}	3.13^{a}	2.96^{a}	2.57^{b}	0.11
Shank	4.87^{a}	4.62^{b}	4.52^{b}	3.64^{c}	4.49^{b}	3.39^{d}	0.07
Spleen	0.22^{a}	0.14^{c}	0.16^{c}	0.25^{a}	0.16^{c}	0.16^{c}	0.01
Caecum	1.24^{a}	1.13^{c}	1.12^{cd}	1.03^{d}	1.97^{a}	0.63^{c}	0.03
Pancreas	0.39^{b}	0.37^{b}	0.32^{c}	0.38^{b}	0.45^{a}	0.21^{d}	0.01
Small Intestine	5.91^{b}	5.88^{a}	7.26^{a}	3.29^{c}	5.71^{b}	2.40^{d}	0.25
Large intestine	1.87^{c}	2.48^{a}	0.93^{f}	1.05^{e}	2.32^{b}	1.19^{d}	0.02
Gizzard	2.47^{c}	3.32^{a}	2.84^{b}	3.22^{a}	2.35^{c}	3.24^{a}	0.09
Bile	0.11^{a}	0.06^{b}	0.05^{b}	0.11^{a}	0.06^{b}	0.06^{b}	0.00
Lung	0.74^{bc}	0.71^{c}	0.82^{a}	0.76^{b}	0.58^{e}	0.64^{d}	0.01

a,b,c,d,e,f means with different superscripts are significantly different (P<0.05)

Table 5: Carcass characteristics of finisher broilers chicken fed full fat palm fruit meal with enzymes

Parameters	(0%) T1	(10% T2	(20%) T3	(30%) T4	(40%) T5	(50%) T6	SEM
Final live weight (kg)	1.50^{b}	1.80^{ab}	1.90^{ab}	2.15^{a}	2.00^{a}	20.00^{a}	0.14
Dressed weight (kg)	1.20^{b}	1.50^{ab}	1.60^{ab}	1.93^{a}	1.70^{a}	1.70^{a}	0.14
Dressed percentage (%)	79.16^{b}	83.61^{ab}	84.26^{ab}	89.46^{a}	84.73^{ab}	85.03^{ab}	2.68
Thigh	8.17^{c}	11.91^{a}	10.85^{ab}	11.28^{a}	9.69^{b}	10.99^{ab}	0.44
Drumstick	11.89^{a}	11.43^{a}	9.35^{ab}	9.36^{b}	8.82^{b}	8.82^{b}	0.48
Wing	8.24^{abc}	8.89^{ab}	6.86^{c}	7.76^{abc}	7.35^{bc}	7.35^{bc}	0.48
Breast	15.74^{d}	23.59^{b}	19.54^{c}	27.63^{a}	20.03^{c}	20.03^{c}	0.85
Back	12.62^{d}	18.67^{a}	13.40^{cd}	14.26^{c}	16.43^{b}	16.43^{b}	0.46
Neck	4.13^{a}	3.15^{ab}	3.42^{ab}	3.08^{b}	3.97^{ab}	3.97^{ab}	0.30

a,b,c,d means with different superscripts are significantly different (P<0.05)

Table 6: Internal organs of finisher broilers Chicken fed full fat palm fruit meal without enzymes

Parameters	(0%) T1	(10% T2	(20%) T3	(30%) T4	(40%) T5	(50%) T6	SEM
Proventriculus	2.04^{a}	1.30^{b}	1.03^{c}	0.74^{d}	0.84^{cd}	0.89^{cd}	0.07
Heart	0.55^{cd}	0.94^{a}	0.69^{b}	0.62^{bc}	0.66^{b}	0.53^{d}	0.02
Liver	3.65^{ab}	3.79^{a}	3.09^{bc}	2.78^{c}	3.15^{abc}	2.93^{c}	0.20
Shank	4.50^{bc}	5.17^{ab}	4.45^{bc}	3.69^{c}	5.46^{a}	4.16^{c}	0.25
Spleen	0.15^{b}	0.27^{a}	0.14^{bc}	0.12^{c}	0.15^{b}	0.15^{b}	0.01
Caecum	1.19^{c}	1.65^{a}	1.42^{b}	0.88^{d}	0.84^{d}	0.81^{d}	0.04
Pancreas	0.27^{c}	0.46	0.45	0.24	0.44	0.35	0.07
Small Intestine	3.02^{bc}	3.94^{a}	3.23^{bc}	3.33^{bc}	3.18^{bc}	2.79^{c}	0.17
Large intestine	5.40^{a}	4.18^{b}	5.87^{a}	3.30^{b}	3.92^{b}	3.45^{b}	0.35
Gizzard	1.17^{b}	1.61^{a}	1.11^{b}	0.71^{c}	1.16^{b}	1.22^{b}	0.04
Bile	0.09^{bc}	0.11^{b}	0.14^{a}	0.80^{d}	0.09^{bc}	0.09^{bc}	0.01
Lung	0.68^{bc}	0.92^{ab}	0.69^{abc}	0.64^{c}	0.87^{abc}	0.93^{a}	0.07

a,b,c,d means with different superscripts are significantly different (P<0.05)