

EFFECT OF DIETARY SUBSTITUTION OF MAIZE WITH PALM PRESS FIBRE ON PERFORMANCE AND COST OF PRODUCING FINISHING BROILER CHICKEN

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Abstract

The soaring cost of maize that make up about 60% of broiler feed production has resulted to exorbitant cost of the feed. This situation calls for discovery of alternatives. A research was therefore conducted to investigate the effect of substituting maize with Palm Press Fibre (PPF) in finisher broiler diet. 120 finishing broilers of 28 days post hatch was randomly assigned to 4 experimental diets in a complete randomized design arrangement. Diet C₁ which was the control diet contained no PPF while in diets C₂, C₃ and C₄ PPF meal replaced maize at 16.67%, 33.33% and 50% respectively making up 10%, 20% and 30% inclusion levels respectively. The broilers were raised on deep litter system, water and feed were provided *adlibitum* and proper routine management practices adopted. The feeding period lasted for 28days. Data was collected on weight gain, feed intake, feed conversion ratio, mortality and cost of producing the broilers. Broilers on the control diet was similar ($P>0.05$) with broilers on C₂ group for weight gain, feed intake and feed conversion ratio but significantly different ($P<0.05$) from C₃ and C₄ groups on these parameters while C₃ and C₄ groups were similar ($P>0.05$) on these parameters. The cost of raising 1Kg chicken was least for broilers in C₂ group, followed by the control and then C₃ while C₄ gave the highest production cost. No mortality was encountered. 16% substitution of maize (10% inclusion) with PPF meal is therefore recommended for finishing broilers production.

Key words: Cost, Diet, Palm Press Fibre, Performance

Introduction

The current exorbitant rise in the cost of feeding broilers has led to the interest in the sourcing for inexpensive alternate feed ingredients as replacement to the more expensive conventional feed ingredients in poultry feed formulation. Maize makes up 55 to 65% of the finished feed for poultry (Ahiwe et al., 2018). Presently in Nigeria, maize has become so expensive. Because of this, cost of feed has become so expensive which has resulted to high production cost. It is therefore crucial to explore the use of other agricultural wastes which has little or no cost in poultry feed production. An agricultural waste of interest is Palm oil Press fibre (PPF) which is the fibrous material that remains after decanting the palm oil mill effluent. Nigeria is ranked fourth largest producer of palm oil in the world, accounting for 3% of global production (Porshare, 2019). Presently, heaps of PPF are seen around most mills within the areas where palm fruit is processed. This could become an environmental problem since the delayed use of PPF has been reported to result in bioconversion to methane, which directly contributes to greenhouse gas emissions (Hafis et al., 2013). The chemical composition of PPF ranges from 6.50% moisture content, 93.91% dry matter, 3.6– 7.5% crude protein, 33.18-35.73 % carbohydrate, 5.56 - 40.13% of fat and 14.6% crude fibre depending on the method of the oil extraction from the oil palm fruit (Heuzé, Tran and Sauvant, 2015). This study therefore evaluated the effect of dietary substitution of maize with PPF meal on the performance and production cost of finishing broilers.

Materials and Methods

The research was conducted at the Teaching and Research Farm, Akanulbiam Federal Polytechnic, Unwana, Afikpo North, Local Government Area, Ebonyi State. Unwana is in tropical rain forest zone of Nigeria.

Collection and preparation of Palm Press Fiber (PPF)

The PPF was collected from a local palm oil mill at Afikpo South, Local Government Area, Ebonyi State, sun dried to crispiness and was taken to a hammer mill for milling to obtain the Palm Press fibre Meal (PPFM). Proximate composition of the PPFM was carried out according to AOAC (2016).

Experimental birds and design

A total of 120 ROSS 308 breed of finishing broilers of 28 days post hatch were used for the research following a Completely Randomized Design (CRD). Each treatment group had 30 broiler birds that were replicated three times. The weight of the birds per replicate groups was adjusted to give near uniform initial weights to all the groups. The broiler birds were managed under deep litter adopting strict ethical standard. Water and feed were given *adlibitum*. The feeding period lasted for 28days.

Experimental diets

Four experimental diets were formulated for the research. Diet C₁ which was the control contained 0% PPFM. In C₂, C₃ and C₄ diets, PPFM substituted maize at 16.67%(10% added), 33.33% (20% added) and 50% (30% added) respectively. The palm press fibre was added on weight to weight basis. The ingredient composition of the diet is represented in table 1.

Table 1. Ingredients and calculated nutrient composition of the experimental diets

Ingredients	Treatment Levels (%)			
	C ₁ (0.00PPFM)	C ₂ (10.00PPF M)	C ₃ (20.00PPFM)	C ₄ (30.00PPFM)
Maize(9%CP)	60.00	50.00	40.00	30.00
PPFM	0.00	10.00	20.00	30.00
GNC	9.00	9.00	9.00	9.00
SBM	8.00	8.00	8.00	8.00
BDG	12.00	12.00	12.00	12.00
Fish meal	3.00	3.00	3.00	3.00
Blood meal	3.00	3.00	3.00	3.00
Bone meal	4.00	4.00	4.00	4.00
*Vit. Premix	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Total	100	100	100	100
Calculated nutrient composition of the diets				
Crude protein (%)	20.46	20.88	21.24	21.60
Crude fibre (%)	3.96	4.41	4.86	5.31
Calcium (%)	0.15	0.47	0.79	0.11
Phosphorus (%)	0.42	0.75	0.08	0.41
Fat (%)	4.61	4.53	5.49	4.37
Ash (%)	6.96	7.53	8.07	8.63
Met. Energy (kcal/kg)	2985.63	2957.04	2935.51	2897.45

To provide the following per kilogram of feed; Vit A 10,000IU; vit D3 1500 IU; Vit. E 2mg; riboflavin 3mg; pantothenic acid 10mg; nicotinic acid 2.5mg; choline 3.5mg; folic acid 1mg; magnesium 56mg; lysine 1mg; iron 20mg; zinc 50mg Cobalt 1.25mg.

Data Collection and analysis

The broiler chickens were weighed using a digital table scale at the beginning and end of the experiment to obtain their weight gain. Feed intake was determined by subtracting the weight of the leftover feed from the weight of feed offered after 24 hours. Feed conversion ratio was obtained by dividing the feed intake with weight gain while mortality was monitored during the course of the research. The cost analysis was computed based on prevailing cost of ingredients used for diet formulation. The data obtained were subjected to statistical analysis using one-way analysis of variance procedure at ($P < 0.05$) level of Significance and computed with GenStat 22 edition analytical software.

Results and discussion

Proximate composition of PPFM

The result of the proximate analysis of the PPFM is presented in table 2. The chemical composition of the PPFM obtained in the present research had a higher level of crude protein compared to report of

(Bamikole and Ikhatua, 2009; Heuzé, Tran and Sauvant, 2015). The difference in the chemical composition could be as a result of the difference in the processing of the palm press (Rhule, 1996).

Table 2. Proximate composition of PPFM

Nutrient	Percentage Levels (DM)
Moisture Content	9.24
Dry Matter	90.76
Crude Protein	12.61
Crude Fiber	7.21
Ether Extract	3.32
Ash	6.87
Carbohydrate	60.78
Metabolizable energy (Kcal/kg)	2,891.16

Source: Field Report, 2021.

Performance of the finisher broilers fed varying levels of PPFM

The performance of the finisher broiler fed different inclusion rates of PPFM as presented in table 3 showed that the final weight, weight gain and feed conversion ratio of broilers in control group was similar ($p>0.05$) with C₂ but significantly ($p<0.05$) bigger than C₃ and C₄ while C₃ and C₄ did not differ ($P>0.05$). The broilers in the control group ate at the same ($P>0.05$) pace with broilers in C₂ and C₃ groups but the quantity consumed by those in C₄ group was higher. The result of the present research is an indication that the broilers in C₂ group utilized palm PPFM efficiently as maize and that PPFM can substitute maize at 16.67% rate (10% inclusion) without causing any deviation in any of the performance parameter. A similar result was reported by Houndonougbo et al. (2012) in their work on rabbit.

Table 4. Performance of finisher broilers fed varying levels of PPFM

Parameters	Treatment levels (%)				SEM
	C1(0.00P PF)	C2(10.00 PPF)	C3 (20.00PPF)	C4(30.00P PF)	
Av. Initial body wt (g)	1193.33	1091.00	1120.00	1030.00	11.55
Av. Final bodywt (g)	2843.33 a	2683.33 a	2180.00 b	1940.00 b	181.05
Av. Body wt gain (g)	1650.00 a	1592.00 a	1060.00 b	910.00 b	179.47
Av. Daily wt gain (g)	78.57 a	75.77 a	50.88 b	43.30 b	8.58
Av. Daily Feed intake (g)	182.79 b	176.17 b	175.10 b	190.57 a	7.26
Feed Conversion ratio	2.35b	2.38b	3.50 a	4.28 a	0.39
Mortality (number)	0	0	0	0	0.0

Note: Without superscript = not significant. Means within row with different super script differ significantly ($P<0.05$) SEM = standard error mean. Av = Average, wt = weight.

Cost effectiveness of finisher broiler feed Varying levels of PPFM

The cost effectiveness of the production as presented in table 5. Showed reduction in the cost of producing 1kg of feed as inclusion level of PPFM increased. The cost of feed consumed by the

broilers within the period of the research was highest for control group. The cost of feed consumed to obtain a kilogram weight gain of the broiler was highest for broiler in C₄ (N991.13) and least for broilers in C₂ group. The result of the present research is an indication that 16.67% substitution rate of maize with PPFM will reduce the cost of producing kilogram chicken.

Table 4. Cost effectiveness of finisher broiler fed varying levels of PPFM

Parameters	Treatment level%			
	C ₁ (0PPF)	C ₂ (10PPF)	C ₃ (20PPF)	C ₄ (30PPF)
Av. Final wt (g)	2843	2683	2180	1940
Av. wt gain (g)	1650	1592	1060	910
Av feed consumed per bird (kg).	5.12	4.93	4.90	5.34
Feed price for 100kg (₦)	23578.25	21328.25	19078.25	1682.25
Feed price per kg (₦)	235.8	213.9	190.8	168.9
Cost of feed consumed per bird (₦)	1207.30	1054.53	934.92	901.93
Cost of feed consumed per bird/kg wt gain (₦)	731.70	662.39	882.00	991.13
Cost of feed consumed per bird per kg final wt (₦)	424.66	393.04	428.86	464.91

Note: wt = weight

Conclusion and Recommendation

The finding from the research showed that palm pressed fibre can tolerate up to 10% inclusion (16.67 substitution rate of maize) in broiler finisher diets without any adverse effect on the performance and cost of producing chicken reduced.

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References

- A.O.A.C. (2016) (Association of Official Analytical Chemists). Official methods of analysis (18th ed.). A.O.A.C International Virginia, USA.
- Ahiwe, E. U, Omede, A., Abdallah, M, Iji, P. (2018). Managing Dietary Energy Intake by Broiler Chickens to Reduce Production Costs and Improve Product Quality. Chapter 6. Animal Husbandry and Nutrition. Intech Open. <https://doi.org/10.5772/intechopen.69938>.
- Bamikole, M. A., Ikhatua, U. J., (2009). Variety diversity effect on the Chemical composition and dry matter degradation characteristics of residue and by-products of oil Palm fruits. *Anim. Sci. J.*, 80(3):239-249.
- Hafis, S. M., Ridzuana, M. J. M., Rahayu, A., Mohamed, B., Farahanac, R. N, Fatina, B. N., Syahrullaild, S. (2013). *Properties of palm pressed fibre for metal forming lubricant applications*. Procedia Engineering 68 (2013) 130 – 137. The Malaysian International Tribology Conference, MITC2013
- Heuzé, V., Tran, G. and Sauvant, D. (2015). Palm Press Fibre. Feedipedia, a program by INRA, CIRAD, AFZ and FAO. <https://www.feedipedia.org/node/15392>. Last updated on May 11, 2015, 14:35
- Houndonougbo, M. F., Chrysostome, C. A. A. M., Attakpa, S. E., Sezan, A., Dehou, H. B. (2012). Growth Performance of Rabbits Fed Palm-Press Fibres-Based Diets. International Scholarly Research Network ISRN Veterinary Science Volume 2012, 5 pages Proshare, (2019). Fact File on Crude Palm Oil (CPO) in Nigeria, Cote d'Ivoire and Ecowas. [https://www.proshareng.com/news/Agriculture/Fact-File-on-Crude-Palm-Oil-\(CPO\)-in-Nig/39032](https://www.proshareng.com/news/Agriculture/Fact-File-on-Crude-Palm-Oil-(CPO)-in-Nig/39032)
- Rhule, S. W. A. (1996). Growth rate and carcass characteristics of pigs fed on diet containing palm press fibre meal. *Animal feed science and Technology*. 61:167-172. Response of turkey poultry graded levels of Alphamune. *Research opinion in Animal and Veterinary Science*, 1:304-308.