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Original Research Article

Replacement Value of Varying Levels of Dried Cocoyam Corm Meal in Place of Maize on Broilers' Performance, Carcass Attributes and Economics of Production

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Abstract

One hundred (100) day old broiler chicks were used to evaluate the replacement value of dried cocoyam corm meal in place of maize on performance, carcass attributes and economcs of production of broiler chicken. The birds were randomly distributed into five (5) treatments of two (2) replicates and ten (10) birds per replicate. The birds were fed 0, 10, 20, 30 and 40% levels of maize replaced with dried cocoyam corm meal for a period of Six (6) weeks. Result showed that there was no significance difference (P>0.05) on the total, weekly and daily weight gain of birds. However, there were significant differences (P<0.05) in the total, weekly, and daily feed intake of birds fed with experimental diet across the treatments. Cocoyam corm meal inclusion diet influenced the liveshrunk, defeathered and dressed carcass weights of broiler chicken. The relative internal organ percentages (liver, pluck, gizzard, intestine and heart) and x [primal parts showed no significant (P>0.05) difference across the birds treated with different levels of maize replaced with dried cocoyam corm meal. Price per kg feed reduced with increased level of dried cocoyam meal in broiler diets. Also price per kg bird reduced with the inclusion of dried cocoyam corn meal in broiler birds but not statistically different (P>0.05). It could therefore be suggested that dried cocoyam meal could be used to replace maize without any negative effect on the performance of the birds up to 40% level of inclusion but rather reduce the price per kg feed formulated and price per kg bird produced.

Keywords: *Broiler performance, Dried cocoyam corm meal, Maize replacement, Carcass characteristics, Feed intake, Growth performance, Feed cost, Poultry nutrition, Alternative feed ingredient, Economic efficiency.*

INTRODUCTION

Poultry production is an increasingly important agricultural industry in the world. Poultry meat and eggs account for about 10% of the total amount of all meat, eggs and milk produced in the world each year (Onu and Madubuike, 2006).

The increasing cost of feed resources in livestock production have been identified as a serious impediment to meeting the demand for animal protein particularly in developing countries (Adejinmin et al, 2000). The need for replacement of the conventional feed ingredients has been paramount in the mind of animal nutrition experts for over a decade (Onyimonyi and Okeke, 2015). If the poultry industry will survive there should be the need for reduction in the cost of feeds and such should not affect the performance of the birds.

Maize supplies the bulk energy in animal feed especially the poultry. This is currently expensive and scarce as a result of low production and higher consumption rate by man. There is a great competition for maize between man and livestock industries. Maize is also put in numerous industrial uses such as production of agro fuels (Obasi, 2009). Aside, reliance on maize as a sole source of dietary energy may be devastating to poultry production because of frequent draught and diseases affecting maize production and utilization. Ngiki et al (2014) reported that the demand for maize has always exceeded its supply, this result in high cost of the grain and has made it uneconomical to be used as a major source of

energy in poultry. Therefore, there is need to search for cheaper and readily available feed ingredient that can replace maize in poultry diet.

Any successful attempt to substitute maize in poultry feed with nutritionally available alternate energy sources especially when it encourages a shift to other ingredients for which there is no competition by human. This will significantly reduce the cost of poultry production and will also enable the average Nigerian have access to poultry products. Cocoyam products are recognized as cheaper carbohydrate sources than grain (Anyaegbu, et al, 2019). Cocoyam possesses readily available energy with easily digestible carbohydrate.

According to Anyaegbu et al. (2016) the Nitrogen Free Extract of fresh xanthosoma sagitifolium was 63.91% and dry cocoyam, 74.40% while crude protein and metabolizable energy were 3.94% and 3179kcal/kg DM respectively. Jone and Garcia (2020) underscore the emerging challenge in modern poultry farming practices. The limited understanding of the impact of replacing maize with cocoyam corn meal on broiler growth performance poses a substantial constraint. There is little information on the possible utilization of cocoyam corn meal in broiler diet hence this research work aimed at assessing the effects of replacing maize at varying levels with dried cocoyam corn meal on performance, carcass attributes and economics of production of broiler chicken.

Materials and Methods

The research was carried out at the Poultry unit of the Teaching and Research Farm of Adeyemi Federal University of Education, Ondo. Fresh cocoyam corns were obtained from the farms located around the University campus. These were peeled, washed, sliced into pieces and dried in the sun. the sun-dried cocoyam corns were milled and then stored in bags for use. other feed ingredients like maize, soya meal, and others were procured from Fexty Feed mill in Ilesa, Osun State. Rations were formulated such that maize was replaced with sundried cocoyam corn meal at 0, 10, 20, 30 and 40% levels. One hundred day-od chick procured from Amo farms, Ibadan, Oyo State were used for this study. Birds were weighted and randomly allotted to five treatments with two (2) replicates with ten birds per replicate following a Complete Randomized Design (CRD).

Table1. Composition of Experimental Diet Showing Maize Replaced with dried Cocoyam Corm Meal at Varying Levels.

	Levels of Maize Replaced with Sun-dried Cocoyam Meal (%)				
Ingredients	0	10	20	30	40
Maize	60.0	54.0	48.0	42.0	36.0
Cocoyam corm meal	0.00	6.00	12.0	18.0	24.0
Soya meal	22.0	22.0	22.0	22.0	22.0
Wheat offal	2.20	2.20	2.20	2.20	2.20
Full fat soya	10.0	10.0	10.0	10.0	10.0
Soya oil	1.00	1.00	1.00	1.00	1.00
Limestone	0.85	0.85	0.85	0.85	0.85
Bone meal	2.50	2.50	2.50	2.50	2.50
Lysine	0.30	0.30	0.30	0.30	0.30
Methionine	0.30	0.30	0.30	0.30	0.30
Salt	0.30	0.30	0.30	0.30	0.30
Broiler premix	0.25	0.25	0.25	0.25	0.25
Toxin binder	0.10	0.10	0.10	0.10	0.10
Chloride	0.10	0.10	0.10	0.10	0.10
L-throenine	0.10	0.10	0.10	0.10	0.10
Total	100.00	100.00	100.00	100.00	100.00

Fresh feeds were weighed and supplied to the birds on daily basis. Weight of left over feeds were also taken on daily basis to determine daily feed intake of the birds. Weights of birds were also taken on weekly basis to determine the weight gain of the birds. Health management practices were observed throughout the experimental period.

At the end of eight weeks experimental period, two birds per replicate making a total of twenty (20) birds were randomly selected for carcass attribute analysis. These were weighed, slaughtered, eviscerated and cut into primal parts. The primal parts were weighed using digital scale. Record of prices per kg feed formulated were taken with total feed consumed per bird to determine the economics of production of the broiler chicken.

Data collected on feed intake, weight gain, weight of Carcass and primal parts with economic parameters were analysed using Analysis of Variance (ANOVA) and the significant differences between treatment means were determined using Duncan Multiple Range Test with the aid of Statistical Package for Social Sciences (SPSS) version 20.

Results and discussion

Table 2: Growth Performance of Broiler Fed Maize Replaced with varying levels of Sun-dried Cocoyam Corm Meal

Parameters	Level Of Maize Replaced with Sun-Dried Cocoyam Meal (%)					
	0	10	20	30	40	SEM
Initial weight (g)	246.35	246.40	244.45	254.57	271.00	2.57**NS**
Final weight (g)	1407.40	1391.50	1349.00	1256.95	1371.17	65.17**NS**
Total weight (g)	1161.05	1106.33	1104.15	1062.55	1100.50	24.24**NS**
Weekly weight gain (g)	193.28	190.61	183.94	189.09	183.30	4.44**NS**
Daily weight (g)	165.67	163.49	157.25	151.60	156.74	6.94**NS**
Total feed intake (g)	3758.50^{a}	3845.50^{a}	4042.50^{b}	4257.00^{c}	4474.00^{d}	35.05
Weekly feed intake (g)	626.43^{a}	640.90^{a}	673.50^{b}	709.50^{c}	746.00^{d}	5.84
Daily feed intake (g)	536.60^{a}	549.35^{a}	577.35^{b}	607.50^{c}	639.00^{d}	5.01
Feed gain ratio (g)	3.444^{a}	3.451^{a}	3.821^{ab}	4.125^{b}	4.295^{b}	0.1
Feed efficiency (g)	0.3082^{b}	0.2972^{b}	0.2727^{ab}	0.2770^{ab}	0.2455^{a}	0.01

abc: Mean values within row carrying different superscripts differ significantly (P<0.05)

The result of growth performance of broilers fed maize replaced with dried cocoyam corn meal is as presented in table 2. Results showed that there is no significant difference (P>0.05) in the initial weight of the experimental birds hence the initial weight could not influence the comparative performance of the birds. The final, weekly and daily weights were not significantly (P>0.05) influence by the inclusion of dried cocoyam corn meal in broilers diet. This result is similar to that of (Ezieshi and Olomu 2011) when they fed chicken with varying levels of maize replaced with yam peel. They observed that body weight of the birds were not significantly (P>0.05) affected. However, it is contrary to the report of Onunkwo et al., (2016) when they fed broiler birds with yellow maize replaced with wild variety of sundried cocoyam, they reported that inclusion influenced the weight gain of the birds at above 10% levels.

There were significant differences (P<0.05) in the total, weekly and daily feed intake of broilers fed with cocoyam corm meal diets when compared with the control. Birds fed with 20, 30 and 40% levels of maize replaced with dried cocoyam corn meal were observed to have higher feed intake when compared with other levels. Birds fed control diet exhibited low total, weekly and daily feed intake. However, the result is statistically not significantly different from that fed 10% level of maize replacement.

This result is contrary to the report of Adejoro et al. (2013) when they fed broilers with sundried, soaked and cooked wild cocoyam (Colocasia esculenta) meal inclusion diet. They reported that inclusion did not significantly reduce feed consumption of the birds in all the treatment groups.

The feed gain ratios were significantly different across the treatment. It was observed that birds fed 30-40% levels exhibited higher feed gain ratio when compared to 0-20% levels. Feed efficiency of birds fed 40% level of maize replacement was significantly lower than those fed 0-20% levels. This suggest that there are possible anti-nutritional factors in the dried cocoyam corn meal. This result is similar to the (Agwunobi 2002 and Okereke 2012) were they reported that phytates impair the utilization of protein and some minerals in the digestive tract of birds and that sundrying alone may not be an effective method of reducing the toxic chemical present in cocoyam corm.

Table 3. Carcass and organs attributes of broilers fed maize replaced with sun-dried Cocoyam corm meal

PARAMETERS	LEVELS OF MAIZE REPLACEMENT(%)						
	0	10	20	30	40	SEM	
Liveshrunk wt (g)	1393.33[a]	1469.00[a]	1502.00[a]	1511.33[a]	1686.00[b]	126.28	
Defeathered wt (g)	1292.00[a]	1329.67a	1400.67[a]	1423.33[a]	1598.33[b]	135.77	
Dressed Carcass	883.00[a]	912.00[a]	935.66[ab]	964.33[ab]	1074.00[b]	97.39	
wt(g)	16.19	16.73	17.39	17.73	18.55	1.48	NS
Thigh(%)	16.06	16.60	16.75	17.32	17.58	1.28	NS
Drumstick(%)	31.20a	33.07ab	33.61ab	34.35b	34.62b	1.79	
Breast(%)	14.05	14.08	14.14	14.92	16.96	2.13	NS
Wing(%)	17.26	18.09	18.19	18.60	18.60	1.29	NS
Back(%)	4.95	4.97	5.12	5.14	5.29	0.49	NS
Neck(%)	4.24	4.26	4.69	4.85	4.87	0.56	NS
Shank(%)	2.48	2.54	2.75	2.89	2.93	0.39	NS
Head(%)	2.37	2.37	2.74	2.77	2.97	0.41	NS
Liver(%)	0.62	0.63	0.69	0.99	0.63	0.274	NS
Pluck(%)	2.72	3.05	3.16	3.33	3.58	0.64	NS
Gizzard(%)	6.55	6.96	7.19	7.70	8.44	1.42	NS
Intestine(%)	0.53	0.57	0.61	0.69	0.75	0.14	NS
Heart(%)							

Abc- mean values within row carrying different superscripts differ significantly (P<0.05)

The results of the carcass characteristics of broiler chickens fed maize replaced with dried cocoyam corm meal is as presented in table 3. The result showed that birds on 40% level of replacement exhibited significantly higher liveshrunk, defeathered and dressed carcass weight compared to 0-10% level.

The thigh, drumstick, wing and back percentages of the experimental birds did not show any significant difference (P>0.05) across the birds fed maize replaced with cocoyam corm meal. However, breast muscle percentages of birds fed 30-40% levels of replacement were significantly higher when compared with the control diet.

This is in conformity with the result obtained by (Anyaegbu, et al., 2016) who reported on carcass characteristic of finisher broiler chicken fed diet containing cooked cocoyam tuber meals. They reported that the percentage cut parts of the experimental broilers on 25% level of replacement recorded the highest breast muscle which was significantly higher than the control group. There were no significant different (P> 0.05) on percent back cut, drumstick, head, shank, thigh, neck and wings of the finisher broilers across the diets.

This is similar to the results Onu and Madubuike (2012) who reported that there is no significant difference (P>0.05) on percentage wings and backcut of the finisher broilers group in all the levels of replacement with sundried cocoyam corm meal.

The percentage weights of the head, shank and neck were not influenced by inclusion of cocoyam corm meals in broiler diets.This is contrary to the observation of Adeyemi (2020) who investigated the impact of cassava supplementation on the morphometric characteristics of broiler chicken, with a control group fed a standard diet without cassava supplementation, and a treatment group fed a diet supplemented with cassava. He reported a significant increase in the morphometric measurements of the neck, shank, and head regions in the broiler chickens that were supplemented with cassava when compared with the control group. Specifically, the neck length, shank circumference, and head width showed notable increases in the cassava-supplemented group.

The relative internal organ percentages (liver, pluck, gizzard, intestine and heart) showed no significant (P>0.05) difference across the groups. The non-significant difference reported for the organs were an indication that the physiological and anatomical functions of these organs were not influenced by the experimental diets. This further indicated that the dried cocoyam corm meals may not have anti-nutritive factors at the levels that may hamper the normal physiological and anatomical functions of the organs of the broilers.

This is similar to the findings of Johnson (2019) who observed the effects of replacing maize with yam peel in broiler chicken diets on the percentages of live weight, gizzard, heart, pluck, and intestine. He reported that there were no significant differences (P > 0.05) in the percentages of these organs between the control and treatment groups. Therefore, replacing maize with yam peel had no significant effect on the organ percentages of broiler chickens.

Table 4: Economic of Production of Broiler Fed Maize Replaced with Varying levels of Dried cocoyam corm meal

Parameters	Levels Of Maize Replaced with Sun-Dried Cocoyam Corm Meal (%)						
	0	10	20	30	40	SEM	
Initial weight (g)	246.35	246.40	244.45	254.57	271.00	2.57	**NS**
Final weight (g)	1407.40	1391.50	1349.00	1256.95	1371.17	265.17	**NS**
Total weight (g)	1161.05	1106.33	1104.15	1062.55	1100.50	24.24	**NS**
Weekly weight gain (g)	193.28	190.61	183.94	189.09	183.30	4.44	**NS**
Daily weight (g)	165.67	163.49	157.25	151.60	156.74	6.94	**NS**
Total feed intake (g)	3758.50^{a}	3845.50^{a}	4042.50^{b}	4257.00^{c}	4474.00^{d}	35.05	
Weekly feed intake (g)	626.43^{a}	640.90^{a}	673.50^{b}	709.50^{c}	746.00^{d}	5.84	
Daily feed intake (g)	536.60^{a}	549.35^{a}	577.35^{b}	607.50^{c}	639.00^{d}	5.01	
Feed gain ratio (g)	3.444^{a}	3.451^{a}	3.821^{ab}	4.125^{b}	4.295^{b}	0.1	
Feed efficiency (g)	0.3082^{b}	0.2972^{b}	0.2727^{ab}	0.2770^{ab}	0.2455^{a}	0.01	
Price /kg feed (₦)	597.54^{e}	567.32^{d}	537.10^{c}	506.88^{b}	476.66^{a}	-	
Price /kg Bird (₦)	2058.16	1958.10	2052.55	2047.66	2041.19	-	**NS**

abc: Means values within row carrying different superscripts differ significantly (P>0.05)
(P<0.05). NS: Not Significant

Results of economics of production of broiler fed maize replaced with varying levels of dried cocoyam corm is as presented in table 4. Result showed that feed gain ratios were significantly different across the treatments. It was observed that birds fed 30-40% exhibited significantly higher feed gain ratio when compared to 0-20% levels. Feed efficiency decreased as the level of replacement increased. This result shows that the inclusion of sun-dried cocoyam corm meal affected the feed efficiency of the broiler chicken, this might be as a result of anti-nutritional agents present in the corm which has some nutritional implications on the animals. This is in line with the report of Esonu, (2012) who reported that the reduced growth of pigs and other animals fed uncooked giant swamp taro (Xanthosoma tannia) could be due to the presence of trypsin inhibitor in the corm. Abdulrashid and Agwunobi. (2012) reported that parboiling and other traditional methods of processing could cause significant reduction in these toxicants (Oxalate, trypsin, chymotrypsin etc) which bound the nutrients in the feed and thereby increasing the utilization of the feed.

The economic analysis revealed that price per kilogram feed reduced with increased in dried cocoyam corm meal in broiler diet. This showed that the inclusion of cocoyam corm in broiler diets reduced cost of production. This result is in lined with the work of Ngiki et al., (2014) on similar cost benefits.

There was no significant difference in the price per kilogram bird produced. This result suggested that the feed efficiency was influenced by the diet. This is in line with the reports of Phillips (2006). Who reported that the feed cost per kilogram bird is not only dependent on the cheap feed but also dependent on the production results obtained with this cheap feed.

Conclusion

Based on the results of the experiment, it could be concluded that inclusion of dried Cocoyam corm meal exerts no significant effect on weight gain of experimental birds. However, it significantly influenced feed consumed by the animals. It has significant effects on broilers primal parts but shows no significant effect on the relative organ weights. Dried cocoyam meal inclusion diet is economically cheaper and readily available and can be used successfully to replace maize meal up to 40% level in broiler diet without any deleterious effect on birds performance but rather reduce the cost of the feed per kilogram and competition for maize between man and livestock industry.

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