Performance of Finisher Broilers fed varying levels of raw (sun-dried) Cocoyam (*Xanthosoma sagittifolium*) Corm Meals

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Abstract: A 35-day study was carried out using one hundred and twenty (120) four-week-old marshal broiler strain birds to determine their performance when fed varying levels of raw sundried cocoyam (*Xanthosoma sagittifolium*) corm meals. Four broiler finisher diets were compounded to contain 0%, 5%, 10% and 15% levels of the cocoyam meal for T_1, T_3, T_3 and T_4 respectively. The birds were randomly divided into four groups of thirty (30) birds each and each group subdivided into three replicates of 10 birds per replicate in a completely randomized design. The result showed that the birds on 0%, 5% and 15% based diets had similar (p>0.05) body weight gains or 10% cocoyam corm meal. There is a general increasing trend in the average daily feed intake as the level of cocoyam meal inclusion increased up to 15%. The birds on 15% cocoyam corm meal had a significantly (p<0.05) higher feed intake (130.17 g/bird) than the feed intake (120.39 g/bird) of the control. That is to say, at 15% cocoyam corm meal level, the antinutritional contents were not high enough as to depress feed intake in finisher broilers. The various diets T_1, to T_4 were well utilized by the various groups of birds going by the general low feed conversion ratio values which ranged from 2.20 to 2.51. However, the lowest cost of feed per kg broiler was achieved with T_3 (10% cocoyam meal), producing at ₦93.87 per kg weight gain. [Report and Opinion 2010;2(8):22-25]. (ISSN: 1553-9873).

Key words: Cocoyam (*Xanthosoma sagittifolium*), corm meal, Finisher broilers, Performance

1. Introduction

Poultry industry is faced with numerous problems, including scarcity of conventional feedstuffs essentially maize which is known to be a rich source of energy for monogastric animals. Energy (a property which some nutrients possess) is required for all life processes including growth, digestion, waste elimination (Summer, 2000). Maize is also put into numerous industrial uses including production of agrofuels (Obasi, 2009., Adeola and Olukosi, 2009), thus diverting maize away from man and animal food chain and this has led to increase in the cost of maize and consequently increase in the cost of poultry feed which is reflected in the high cost of poultry production

Therefore, there is need for continued and consistent search for alternative source of energy that is cheap when compared to maize that could take the place of maize in poultry ration formulation. To this end, tannia (*Xanthosoma sagittifolium*) appears to hold some promise as it seems to possess readily available energy with easily digestible carbohydrate. Bello (1976) had described cocoyam as possessing nutritional quality which could compare favourably with cassava, potatoes and yam.

Xanthosoma sagittifolium is a high-yielding, disease resistant crop. It is almost competition-free with man in most places as it is eaten only as a last resort when a family can no longer afford garri or yam. It is therefore more likely to be available for use at lower cost. Its energy content appears moderate when compared with maize. However, like most varieties of cocoyam, the problem with *Xanthosoma sagittifolium* is its content of some antinutritional factors which could be a limitation to its use (Okon *et al*, 2007). This limiting factors can be removed by boiling or sun-drying (Abdulrashid *et al*, 2006). Ohaemenyi (1993) reported that *Xanthosoma sagittifolium* corms can be cooked and used to some extent in the diets of growing pigs.

Esonu (2000) reported that starter broilers could tolerate up to 20% inclusion levels of wild variegated cocoyam (*Canadium hortulanum*). There is limited work on the proximate and optimum inclusion level of raw *Xanthosoma sagittifolium* in broiler finisher rations, hence the need to investigate effect of feeding varying levels of *Xanthosoma sagittifolium* as a replacement for maize on the performance of finisher broilers and the economic implication of incorporating cocoyam in broiler finisher diets.

2. Material and Methods

The cocoyam used for this work was harvested in refuse areas and fallow lands in Mgbirichi, Ohaji/Egbema LGA, Imo State. In this area, they grow wild as they are not eaten by the villagers in normal situations. The corms were harvested, cleaned of soils and then chopped into bits, sun-dried for 7 days, milled and used in the formulation of broiler finisher diets.

Four experimental diets were compounded to contain 0, 5, 10 and 15% levels of the cocoyam meal for T_1, T_2, T_3 and T_4 diets respectively (Table 1).

Table 1: Composition of the Experimental Diets

Ingredients	T_1	T_2	T_3	T_4
Maize	60	55	50	45
Cocoyam meal	0	5	10	15
Soybean meal	16	16	16	16
Wheat offal	10	10	10	10
Palm kernel cake	6	6	6	6
Fish meal	3	3	3	3
Blood meal	3	3	3	3
Bone meal	2	2	2	2
Oyster shell	1	1	1	1
Salt	0.25	0.25	0.25	0.25
*Vitamin/Mineral 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
Total	100.00	100.00	100.00	100.00
Calculated nutrient composition (%)				
Crude protein	20.70	20.60	20.49	20.39
Crude fibre	4.41	5.07	5.73	6.39
Ether extract	3.63	3.56	3.48	3.41
ME (kcal/kg)	3063.20	3020.24	2977.29	2934.33

*To provide the following per kg of feed: Vit A 5,000,000 I.U.; Vit D_3 1,000,000 I.U.; Vit E 16.0g; Vit K 1.0g; Vit B_1 0.509mg; Riboflavin 2.4mg; Pyridoxine 0.35mg; Niacin 3.5mg; Biotin 0.005mg; Choline chloride 30.0mg; Folic acid 0.1mg; Vit B_{12} 0.002mg; Vit C 2.50mg; Mn 10.0mg; Zn 4.5mg; Cu 0.20mg; Fe 5.00mg; Methionine 2.0mg; Calcium pantothenate 1.0mg.

Feeding trial

One hundred and twenty (120) marshal broiler strain birds which were four-week-old were used for this experiment. The birds were procured at day-old and reared on a commercial feed for four weeks before being introduced to the experimental diets. The birds were randomly divided into four groups of thirty (30) birds each and each group subdivided into three (3) replicates of 10 birds per replicate. The experimental diets were randomly assigned to each of the four groups which were all kept under identical management conditions.

Water and experimental diets were given to each group *ad libitum*. Feeds were weighed daily and offered to the various replicates every morning and the leftover for each replicate ascertained the following morning to determine the average daily feed intake. The birds were weighed at the beginning of the experiment to obtain the average initial body weights of the various treatment groups, and at the end of every week until they are 9 week-old.

Chemical analysis

The cocoyam meal was subjected to proximate analysis to determine its contents of crude protein, crude fibre, ether extract, nitrogen free extract and ash (AOAC, 1990), from which its metabolisable energy (ME) was estimated (Morgan *et al* 1975).

Experimental design and statistical analysis

The design used for this experiment is the Completely Randomized Design (CRD), and the data generated on feed intake, weight gain, feed conversion ratio were subjected to analysis of variance (ANOVA) and Duncan's multiple range test (DMRT) was used to detect differences among treatment means (Steel and Torrie, 1980).

3. Results

The performance of the finisher broiler birds fed varying levels of raw sun dried cocoyam meals is presented in Table 2. The result showed that there was no significant difference ($p>0.05$) in body weight gain among T_1, T_2, and T_4. However, the birds on T_3 and T_4 had similar ($p>0.05$) body weight gain. Numerically, however, the birds on 10% cocoyam meal (T_3) recorded the highest daily weight gain (57.86 g/bird/day).

There is a general increasing trend in average daily feed intake as the level of cocoyam meal inclusion increased up to 15%. The birds on 15% cocoyam corm meal had a significant ($p>0.05$) higher feed intake (130.17 g/bird) (p>0.05) than the feed intake (120.39 g/bird) of the control birds.

The feed conversion ratio of T_1, T_2, and T_4 were similar (p>0.05), and the T_3 birds had the lowest feed conversion ratio (2.20). The average cost of feed per kg decreased with increasing level of cocoyam meal.

Table 2: Proximate Evaluation of Maize Meal and Cocoyam Meal

	Maize	Cocoyam
Dry matter (%)	89.50	87.20
Crude protein (%)	9.0	19.14
Crude fibre (%)	2.8	9.45
Ether extract (%)	4.2	7.08
Ash (%)	1.5	4.30
Nitrogen free extract (%)	72.0	47.23

Table 3: Performance of Finisher Broilers Fed Increasing Levels of Cocoyam Meals

Parameters	T_1	T_2	T_3	T_4	SEM
Initial body weight (g)	550^{ab}	552^{a}	550^{ab}	549^{b}	0.73
Average final body weight (g)	1990^{ab}	1939.1^{b}	2170^{a}	2022.08^{ab}	57.37
Average body wt gain (g/day)	51.43^{b}	49.54^{b}	57.86^{a}	52.61^{ab}	2.06
Average feed intake (g/day)	120.39^{b}	124.08^{ab}	127.26^{ab}	130.17^{a}	2.43
Feed conversion ratio (FCR)	2.34^{ab}	2.51^{a}	2.20^{b}	2.47^{ab}	0.09
Mortality (No.)	0	3	1	3	-
Economic consideration:					
Coat of feed (N/kg)	44.47	43.57	42.67	41.77	
Cost of feed/kg wt gain	104.06	109.36	93.87	103.17	

ab means within a row with different superscripts are significantly (p<0.05) different.

4. Discussions

The reason for the improved performance in daily weight gain as the inclusion level of cocoyam meal increased up to 15% could be because the resulting diets were not high in crude fibre to the point of causing depression in mineral availability, trace mineral retention and increased metabolic nitrogen excretion (Hedge *et al*, 1978; Nwokolo *et al*, 1985). It also implied that the increasing levels of the antinutritional factors arising from increasing inclusion levels of cocoyam meal were not high enough at 15% cocoyam as to depress performance.

The birds consumed higher quantity of the raw cocoyam corm meal because at 15% cocoyam corm meal, the toxic level of the antinutritional factors was not high enough as to depress feed intake, hence it did not lower the feed intake as is usually the case with the antinutritional factors (such as phytate, oxalate, tannin, saponin and HCN) of unboiled cocoyam (Agwunobi *et al*, 2002). Furthermore, the birds were trying to consume more feed to meet the daily metabolisable energy requirement, as is usually the case when the diets are balanced and not deficient in several nutrients (Hill and Dansky, 1954). This report agrees with the work of Abdulrashid (2006) and Agwunobi (2009) who reported a lower daily feed intake in the control when compared with the various treatment levels of raw sun dried and boiled cocoyam, attributing it to the higher energy in maize relative to cocoyam. According to Afolayan *et al* (2009), dietary energy level is a major factor influencing feed intake and feed efficiency; broilers will consume more of low energy feeds at a constant growth rate while they consume less of high energy feeds to obtain its nutrient requirements thereby improving feed efficiency.

T_3 diet (diet with 10% cocoyam meal) resulted in a ration that is better utilized than any other ration by the birds. Generally, the various diets T_1 to T_4 (0 to 15% cocoyam meal diets) were well utilized by the birds given their general low feed conversion ratio values (2.20 – 2.51). This indicates that the various groups of finisher broilers were able to extract and utilize the required nutrients from the treatment diets as the levels of antinutritional factors were not detrimental to the birds.

The average cost of feed per kg that decreased with increasing level of cocoyam meal was due to the reduced cost of cocoyam relative to maize. The lowest cost of feed per kg broiler was achieved with the T_3 diet (10% cocoyam meal) producing at ₦93.87 per kg weight gain.

5. Conclusion

The study showed that raw sun dried cocoyam meal can be used in the diet of finisher broilers up to 15% inclusion level without being detrimental to their performance. However, it appears that 10%

cocoyam inclusion level seems to be the best in terms daily weight gain, feed conversion ratio, and cost effectiveness.

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