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SHORT NOTE [NOTA CORTA]

EFFECT OF REPLACING MAIZE WITH CASSAVA ROOT MEAL AND MAIZE/SORGHUM BREWERS' DRIED GRAINS ON THE PERFORMANCE OF STARTER BROILERS

[EFECTO DEL REEMPLAZO DE MAÍZ CON HARINA DE RAÍZ DE YUCA Y RESIDUOS SECOS DE DESTILERÍA DE MAÍZ/SORGO SOBRE EL DESEMPEÑO DE POLLOS DE ENGORDA]

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SUMMARY

A study was carried out with one hundred and twenty one-week-old Hubbard broilers to determine the effect of replacing maize with cassava root meal (CRM) and maize/sorghum brewers' dried grains (MSBDG) on performance of starter broilers. Four experimental diets were formulated to contain 0, 15, 30 and 45% CRM and MSBDG combined in the ratio of 1:1 in the broiler starter rations. There was no difference (P>0.05) in feed intake among the birds on 0, 15 and 45% CRM/MSBDG, but these were lower (P<0.05) than the feed intake of birds on 30% CRM/MSBDG. There was no difference (P>0.05) in daily weight gain among the birds on 0, 15 and 30 CRM/MSBDG diets, and each of these was higher than that of the birds on 45% CRM/MSBDG diet. The feed convertion ratio of 0% compared favourably with that of the birds on 15% diets, and these two diets were better (P<0.05) utilized than 30% and 45% CRM/MSBDG diets. The result showed that CRM/MSBDG can be successfully incorporated in broiler starter diets up to 30% dietary level.

Keywords: Broilers; cassava root meal; poultry performance

RESUMEN

Se evaluó el efecto de reemplazar maíz con harina de raíz de yuca (CRM) y residuos secos de destilería de maíz/sorgo (MSBDG) sobre el desempeño de pollos de engorda Hubbard. Se formularon cuatro dietas experimentales que contenían, 0.0, 15, 30 y 45% CRM y MSBDG combinados 1:1 en la ración de inicio de pollos de engorda. No se encontró diferencia (P>0.05) en consumo en las aves con 0, 15 y 45% CRM/MSBDG, pero fueron menores (P<0.05) que 30% CRM/MSBDG. No se encontró diferencia (P>0.05) en la ganancia de peso entre 0, 15 y 30% y fueron mayores que 45% CRM/MSBDG. La tasa de conversión en 0% se comparó favorablemente con 15% y estas dos fueron mejores (P<0.05) que 30 y 45% CRM/MSBDG. Los resultados muestran que CRM/MSBDG puede ser exitosamente incorporado en las dietas de inicio hasta en un 30%.

Palabras clave: Pollos engorda; raíz de yuca; desempeño de aves.

INTRODUCTION

Energy and protein feedstuffs have been the major hindrances to effective poultry production in Nigeria. This is mainly because of the high cost of these feedstuffs. The feedstuff mainly used in poultry feeds in Nigeria is maize. Competition between man and livestock for maize is increasing day by day thus the need to scout for alternative and perhaps cheaper sources of energy for poultry.

It was estimated that in 2004, cassava production in Nigeria was about 38.18 million metric tons (FAO, 2005), making Nigeria the largest producer of cassava in the world. Cassava root meal (CRM) is basically an energy source. Its greatest advantage being the high caloric value yield per unit area, which is about 13 times more than maize (Oyenuga, 1961). The inclusion levels of 8 – 60% have been recommended for poultry provided the rations are balanced with respect to other essential nutrients (Igwebuike and Okonkwo, 1993). According to Ekpo *et al*. (2008), composite cassava tuber meal is not only a cheap alternative feedstuff to maize, it promotes feed intake and weight gain in monogastric farm animals. Cassava root meal (CRM) besides being low in crude protein (about 4%), also

contains toxic substance, linamarin which produces hydrocyanic acid when acted upon by the enzyme linamarase (McDonald *et al*, 1988; Igwebuike and Okonkwo, 1993). However, indigenous methods of removing the cyanogenic glucoside in cassava root include, boiling, grating and squeezing, fermentation and exposure to sun for a few days (McDonald *et al*., 1988; Ogbonna, 1991).

Maize/sorghum brewers' dried grain (MSBDG) is a by-product of beer production. It is a moderate source of energy (2040kcal/kg ME) and contains about 28% crude protein (Uchegbu, 1995). Since cassava is relatively low in crude protein, it becomes necessary to combine it with a feedstuff with a relatively high crude protein content in order to bring the final product as close as possible to maize which it seeks to replace in terms of crude protein. A 1:1 combination of CRM and MSBDG would appear to give a close enough metabolizable energy and crude protein to maize.

This study aims therefore at assessing the performance of starter broilers fed diets containing combinations of cassava root meal and maize/sorghum brewers' dried grains.

MATERIALS AND METHODS

The MSBDG used for this study was obtained wet from Consolidated Breweries Plc, Awo-Omamma, Imo State. It was sun-dried for 4-days and then ran through a hammer mill to break the lumps and make it suitable for ration formulation. Cassava root tubers used for the cassava root meal were obtained from a local market in Mgbirichi – Ohaji, Imo State, Nigeria. Whole tubers were cut into slices and spread in the sun to dry. Drying took 5 – 6 days, after which the dried cassava slices were milled in a hammer mill to obtain the cassava root meal (CRM). The samples of maize, MSBDG and CRM were analyzed to determine their contents of crude protein, crude fibre, ether extract, nitrogen free extract and ash (AOAC, 1990).

Four experimental diets were formulated to replace with CRM/MSBDG 0.0, 25.0, 50.0 and 75.0% of maize in the original diet and contain 0.0, 15.0, 30.0 and 45.0% CRM and MSBDG combined in a ratio of 1:1, in the four experimental diets respectively. Other ingredients were included at the same level for each of the four treatment diets (Table 1). The nutrient composition of the treatment diets was calculated using feed composition tables (Obioha, 1992; Aduku, 1993).

Feeding Trial

One hundred and twenty, one-week old Hubbard broilers were divided into 4 groups of 30 birds each and randomly assigned to the experimental diets in a completely randomized design (CRD). Each treatment group was divided into three replicates of 10 birds each. The birds were kept under the same management condition on cemented floor covered with wood shavings. The experimental diets and water were offered *ad libitum*. The birds were weighed at the beginning of the experiment and on a weekly basis thereafter. Feed intake was recorded daily. The experiment lasted 28 days.

Data collected were subjected to analysis of variance (ANOVA), and where significant treatment effects were detected, Duncan's New Multiple Range Test (DNMRT) was used to detect differences between means (Steel and Torrie, 1980).

Table 1. Composition of Treatment Diets

Ingredients	Dietary levels of CRM/MSBDG (%)			
	0.0	15.0	30.0	45.0
Maize	60.0	45.0	30.0	15.0
CRM/MSBDG	0.0	15.0	30.0	45.0
Soybean meal	20.1	20.0	20.0	20.0
Palm kernel cake	2.0	2.0	2.0	2.0
Wheat offal	7.0	7.0	7.0	7.0
Fish meal	4.0	4.0	4.0	4.0
Blood meal	3.0	3.0	3.0	3.0
Bone meal	2.0	2.0	2.0	2.0
Oyster shell	1.0	1.0	1.0	1.0
L-Methionine	0.25	0.25	0.25	0.25
L-Lysine	0.25	0.25	0.25	0.25
Vitamin/ Mineral Premix*	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 (%)				
Crude protein	22.14	22.83	23.49	24.14
Crude fibre	3.62	4.53	5.46	6.37
Ether extract	3.42	3.48	3.58	3.63
ME (kcal kg^{-1})	3057.5	2966.2	2874.7	2783.2

*To provide the following per kg: Vit – 5,000iu; Vit D_3 – 1,000iu; Vit E – 16.0g; Vit K – 1.0g; Vit B – 0.509mg; Riboflavin – 2.4mg; Pyridoxine – 0.35mg; Niacin – 3.5mg; Biotin – 0.00mg; Choline chloride – 30.0mg; Folic acid – 0.1mg; Vit B_{12} – 0.002mg; Vit C – 2.50mg; Mn 10.0mg; Zn – 4.5mg; Co – 2.225mg; Iodine – 0.155mg; Se – 0.01mg; Cu – 0.20mg; Fe – 5.00mg; Methionine – 2.0mg; Calcium pantothenate – 1.0mg.

RESULTS

The nutrient composition of the treatment diets showed an increasing crude protein (CP) and decreasing metabolizable energy (ME) levels with increasing inclusion levels of CRM/MSBDG in the diet (Table 1). Result of the proximate values of maize, maize/sorghum based brewers dried grains

(MSBDG) and cassava root meal (CRM) is shown in Table 2. The performance of the starter broilers on the treatment diets is presented in Table 3. There was no significant difference ($p>0.05$) among the treatment groups in daily body weight gain except for the 45.0% CRM/MSBDG birds which was significantly ($p<0.05$) lower. However, birds on 30.0% CRM/MSBDG compared favourably ($p>0.05$) with birds on 45.0% CRM/MSBDG diet in all parameters measured except in daily feed intake where the birds on 30.0% CRM/MSBDG recorded significantly ($p<0.05$) higher feed intake than the birds on 45.0% CRM/MSBDG diet.

Feed intake was similar for all the CRM/MSBDG diets except at 30.0% where the birds recorded a significantly ($p<0.05$) higher feed intake. Birds on 0.0% CRM/MSBDG recorded the lowest feed conversion ratio (FCR), which however is similar ($p>0.05$) to the value for birds on 15% CRM/MSBDG diet.

Table 2: Comparative Proximate Compositions of Maize, Cassava Root Meal and Maize/Sorghum Brewers' Dried Grains (MSBDG)

	Maize	MSBDG	CRM
Dry matter (%)	89.50	87.20	87.75
Crude protein (%)	9.0	19.14	3.59
Crude fibre (%)	2.8	9.45	3.70
Ether extract (%)	4.2	7.08	0.70
Ash (%)	1.5	4.30	2.40
N free extract (%)	72.0	47.23	77.36

Table 3. Performance of Starter Broilers fed different CRM/MSDBG dietary levels

Parameters	Inclusion level of CRM/MSBDG (%)				
	0.0	15.0	30.0	45.0	SEM
Initial body weight (g)	104.0^{a}	104.0^{a}	100.0^{b}	100.0^{b}	1.00
Final body weight (g)	492.0^{a}	461.0^{a}	439.0^{ab}	389.0^{b}	18.77
Daily body gain (g)	13.86^{a}	12.75^{a}	12.10^{ab}	10.32^{b}	0.64
Daily feed intake (g)	54.5^{b}	55.0^{b}	58.0^{a}	52.5^{b}	0.98
Feed conversion ratio (g feed/g gain)	3.39^{b}	4.31^{ab}	4.83^{a}	5.09^{a}	0.32
Mortality (%)	9.0	9.0	0.0	16.0	

a, b, ab means within a row with different superscript are significantly ($p<0.05$) different

DISCUSSION

The crude protein value of MSBDG (19.14%) is close to the crude protein contents of brewers' dried grains from three different sources which ranged from 23 – 25% (Olupona *et al*., 2002). The MSBDG crude fibre content (9.45%) is similar to the values reported by Olupona *et al*., (2002) and lower than the value (13%) reported by Uchegbu and Udedibie (1998). Cassava root meal with a crude protein value of 3.59% is lower than the crude protein value of MSBDG (19.14%) and that of maize (9%). However, it is expected that the crude protein obtained from the combination of CRM/MSBDG would be close to the required level as being contributed to the feed normally by maize.

The similarity in daily weight gain among the birds fed 0.0, 15.0 and 30.0% CRM/MSBDG diets indicated that the three diets met the recommended levels of 2800 – 3000 kcal/kg ME and 22 – 23% crude protein (Oluyemi and Roberts, 1979; Obioha, 1992 and Aduku, 1993). The significant depression ($p<0.05$) in daily weight gain for the birds on 45% CRM/MSBDG diet could probably be attributed not only to the slight shortfall in its metabolizable energy content of the diet but also poor utilization of nutrients. The poor utilization of nutrients might have resulted from the high crude fibre (6.37%) content of the diet. The crude fibre level is more than the recommended level (5.0%) for starter broilers (Obioha, 1992). A high crude fibre in broiler starter diet obviously would mask the availability of minerals and depress nutrient digestibility significantly (Hedge *et al*, 1978; Nwokolo *et al*, 1985).

The daily feed intakes were comparable for birds on 0.0, 15.0 and 45.0% CRM/MSBDG diets and these were significantly ($p<0.05$) lower than the feed intake of birds on 30.0% CRM/MSBDG. Generally feed intake increased with increasing levels of CRM/MSBDG, except for the 45% CRM/MSBDG diet. The reason for the increased in feed intake as CRM/MSBDG levels increased could be attributed to the progressive dilution of energy concentration of the diets with increasing levels of CRM/MSBDG; thus the birds had to increase their feed intake to compensate for the low concentration of the available energy. This agrees with the observation that feed consumption is

determined by the level of energy in the diet (Hill and Dansky, 1954; Uko *et al*, 2001). However, the deviation from the increasing feed intake trend at 45.0% CRM/MSBDG could be attributed to the fibrous nature of the diet which perhaps brought about physical bulk which limited the intake of the more fibrous diet. This contrasted with the expectation of higher feed intake due to the feed's lower energy content.

The feed conversion ratio (FCR) of the birds on the control (0.0% CRM/MSBDG) diet was the lowest and the best when compared with other treatment groups. The control diet however compared favourably with the FCR for birds on 15.0% CRM/MSBDG diet. This suggests that 0.0% and 15.0% CRM/MSBDG diet were better utilized than 30.0 and 45.0% CRM/MSBDG diets, indicating that the increasing level of fibre might have impeded the extraction of nutrients by these young birds. In economic terms, it will be convenient to utilize CRM/MSBDG up to 30% in replacement for maize considering the fact that maize of equal proportion will be more costly. Also, MSBDG in most cases is considered a waste product by the brewing companies and so a little monetary value is attached to it which makes its inclusion in broiler diets very economical.

The mortality value for 45.0% CRM/MSBDG was highest, but the mortality values among the treatment groups did not however follow a pattern as to suggest that they were as a result of increasing levels of CRM/MSBDG.

CONCLUSION

The results showed that CRM/MSBDG could be successfully used in broiler starter diets at 30% dietary level. Considering the availability and cheapness of obtaining MSBDG and CRM, it is economically convenient to replace maize with a combination of CRM/MSBDG. Higher level of inclusion up to 45% depressed performance though without any deleterious health effect.

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