Online Journal of Animal and Feed Research
Volume 1, Issue 5: 160-164 (2011)
ISSN 2228-7701

GROWTH PERFORMANCE AND ECONOMY OF REPLACING MAIZE WITH COMBINATIONS OF BREWERS' GRAINS, JACK BEAN AND CASSAVA ROOT MEAL IN BROILER FINISHER RATIONS

M.C. Uchegbu[1]*, U. Herbert[2], I.P. Ogbuewu[1], C. H. Nwaodu[1], B.O. Esonu[1] and A.B.I. Udedibie[1]

[1]*Department of Animal Science and Technology, Federal University of Technology, P.M.B.1526, Owerri, Imo State, Nigeria.*
[2]*Department of Animal Production and Management, College of Animal Science and Animal Production Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria.*

*Email: princiano2001@yahoo.com

ORIGINAL ARTICLE

ABSTRACT: *This study was done to determine the effect of complete replacement of maize with maize/sorghum-based brewers' dried grains (MSBDG), jackbean (JB) and cassava root meal (CRM) on performance of finisher broilers and the feed cost implication of using these test materials as the major energy sources. Four experimental diets T_1, T_2, T_3 and T_4 were formulated to contain maize, MSBDG, JB and CRM in the following proportions 60, 0, 0, 0%; 0, 20, 15, 25%; 0, 20, 20, 20%, and 0, 20, 25, 15% respectively. Other ingredients were the same for the four diets. One hundred and sixty eight (168) 4-week-old Hubbard broilers were divided into 4 treatment groups of 42 birds each; and each group subdivided into 3 replicates of 14 birds per replicate. Each treatment group was randomly assigned to an experimental diet in a completely randomized design (CRD) experiment. The feed intake of T_1, T_2 and T_4 birds were similar ($P>0.05$) but lower ($P<0.05$) than that of T_3 birds. There was no significant ($P>0.05$) difference in daily weight gain between T_1 (1.70g) and T_2 (1.55g) birds. The feed conversion ratio of T_1 birds was better ($P<0.05$) than T_2, T_3 and T_4 birds. The feed cost of N195.58 for T_4 required to produce 1kg meat was lower than the cost of N214.50 required for meat production in T_1. Generally, the MSBDG/JB/CRM feeds produced 1kg meat at costs 6.17%, 3.71% and 8.82% for T_2, T_3 and T_4 lower than the T_1 diet.*

Keywords: *Broilers, feed ingredient combinations, performance*

INTRODUCTION

The conventional energy ingredient in poultry ration is maize. Maize and/or guinea corn constitutes over 50% of the diet for the different classes of poultry (Iyayi, 2009). Since intake of other nutrients is controlled by energy intake, it becomes imperative that poultry rations contain ingredients that will supply adequate amount of energy to meet the birds' requirement for production.

Maize is a staple for humans, livestock and poultry, and now fuel. This rising demand for maize for alternative uses has driven the cost of maize upwards (Good, 2006). Nigeria has never produced enough maize to meet the demand for human consumption, the beverage industries and livestock production. Whereas in the United States, maize is grown largely for livestock feeding with about 80 – 90% maize included in the rations for cattle, in Nigeria none of the sectorial units of the nation's industry that use maize hardly get enough. It could be attributed in part to its poor yield. FMWR (2008) has reported that the potential yield of maize is about 8 tons/ha while the actual average yield is about 3.9 tons/ha. Similar pattern was reported for millet, sorghum, rice and some tubers like sweet potato and cassava.

According to Uchegbu et al. (2004), prices of feed ingredients have gone so much high that poultry producers in Nigeria are focusing on unconventional alternatives rather than on conventional ones like maize, soybean and other possible ingredients to achieve reduced cost of production. At present, the astronomical rise in the prices of these conventional ingredients (maize, soybean, groundnut cake and fish meal) has put enormous pressure on the poultry farmer to look for alternatives.

To cite this paper: Uchegbu, M.C., Herbert, U., Ogbuewu, I.P., Nwaodu, C.H., Esonu, B.O. and Udedibie A.B.I. 2011. Growth performance and economy of replacing maize with combinations of brewers' grains, jack bean and cassava root meal in broiler finisher rations. *Online J. Anim. Feed Res.*, 1(5): 160-164.
Journal homepage: http://www.ojafr.ir

A brief survey of literature shows that efforts have been made by researchers in Nigeria for over four decades to find alternative sources of feeds from unconventional feed ingredients that are readily available at reasonable prices (Udedibie and Emenalom, 1993; Uchegbu et al., 2004). Each of these researchers has succeeded in reducing the maize component of the diets incompletely. Thus there appeared to be no alternatives as good as maize. Hence there is need for a continued search for an ingredient or combinations of ingredients that would simulate maize in poultry diet. Maize/sorghum brewers' dried grain is the extracted residue of maize and sorghum which resulted from the production of beer. It is a moderate source of energy and contains a high percentage of protein relative to maize (Uchegbu, 1995).

Raw jackbean contains 28.5% crude protein, 7.8% crude fibre, 3.1% ether extract. However, the crude protein content of jackbean has been reported to drop to 25% after boiling or autoclaving (Udedibie, 2003); in an effort to reduce its anti-nutritional contents such as canavanine, concanavalin A, urease, canatoxin, etc. (Udedibie et al., 2004). Cassava root is abundantly produced in Nigeria, especially Eastern Nigeria, and the mature root can be left in the soil for as long as two years (Irvine, 1979), hence it is available throughout the year. Cassava root meal has been reported to be low in protein (2.4%) (Aduku, 1993) and relatively high in energy (3620 kcal/kg ME). Attempts to use cassava as a source of energy in poultry diets as replacement for maize have, however, yielded conflicting results. This is because cassava tuber contains cyanogenic glucoside, linamarin. Linamarin is deglycosylated by the enzyme, linamarase, yielding acetone cyanohydrins, which spontaneously converts to hydrogen cyanide once it is ingested (Sayre, 2007). Methods of detoxifying cassava tubers include sun drying (Odukwe, 1994) cooking, (Okeke et al., 1985), use of additives (Obioha et al., 1984) and fermentation (Udedibie et al., 2004). The price of cassava is low relative to maize, although man also consumes it. Having considered the attributes of brewers' dried grains, jackbean and cassava, it appeared that appropriate combinations of these ingredients could result in product(s) which could serve as a major energy source in complete replacement of maize in finisher broiler ration.

The objective of this study is therefore to evaluate the performance, of finisher broilers fed diets containing combinations of BDG, jackbean and cassava root meal in complete replacement of maize and the cost effectiveness of using such diets in finisher broiler production.

MATERIALS AND METHODS

Experimental Site

This research was carried out in the Poultry unit of the Teaching and Research Farm of the Department of Animal Science and Technology, Federal University of Technology, Owerri, Imo State. Imo state (4^{o}4' - 6^{o}3' N, 6^{o}15' - 8^{o}15' E) is situated in south-eastern agro-ecological zone of Nigeria.

Sources and Processing test ingredients

The maize/sorghum-based brewers dried grains used for this study was obtained from Consolidated Breweries Plc., Awo-Omamma, Imo State, the brewers of '33' Export Larger Beer. It was sundried for 5 day. The brewers dried grains was then run through a hammer mill to break up its lumps before being used in ration formulation. The jackbean used for this experiment was obtained from Jos, Plateau State. The jackbean was cracked, and then soaked in water for 2 days, boiled for 1 hour, then sundried and milled before use in the formulation of the experimental diet. The cassava tubers used for this experiment were produced at Mgbirichi – Ohaji, Imo State. The whole fresh tubers were cut in small slices of about 0.1 – 0.2cm and then spread on a platform under the sun to dry. These slices were completely dried within 5 days. The dried cassava chips were then milled to produce the cassava root meal (CRM). Each of these 3 feedstuffs (MSBDG, JB and CRM) was sent for proximate analysis using standard methods (AOAC, 1995).

Experimental diets, birds and design

Maize/sorghum-based brewers dried grains, jackbean and cassava root meal which were combined at varying proportions to completely replace maize in all the diets except in the control diet as shown in Table 1. One hundred and sixty eight (168) broiler chicks at 4 weeks of age were selected for this trial. The birds were divided into 4 groups of 42 birds each. Each group was subdivided into 3 replicates of 14 birds in a completely randomized design experiment. Each group was randomly assigned to an experimental diet. The experimental diets were weighed daily and fed to the birds at about 8:00 am. Before feeding the birds the following morning, the leftover feeds of the previous day were weighed in order to obtain a record of the daily feed intake. Water was supplied *ad libitum*. However, stale water was changed daily and drinking trough thoroughly cleaned before filling with fresh water every morning. Damp litters were usually removed and replaced with fresh ones.

Data collection

The birds were weighed at the beginning of the experiment and weekly thereafter. Feed intake was determined by the difference between the quantity offered and the leftover the following morning. The experiment lasted for 5 weeks. Data were collected on initial body weight, final body weight, daily weight gain, feed intake, feed conversion ratio, and mortality.

To cite this paper: Uchegbu, M.C., Herbert, U., Ogbuewu, I.P., Nwaodu, C.H., Esonu, B.O. and Udedibie A.B.I. 2011. Growth performance and economy of replacing maize with combinations of brewers' grains, jack bean and cassava root meal in broiler finisher rations. *Online J. Anim. Feed Res.*, 1(5): 160-164.
Journal homepage: http://www.ojafr.ir

Data analysis

Data collected on daily weight gain, feed intake and feed conversion ratio were subjected to one-way analysis of variance (ANOVA). Where significant treatment effects were detected from the ANOVA, means were compared using Duncan's new multiple range test as outlined by Steel and Torrie (1980).

Table 1 - The ingredient compositions of experimental diets fed to finisher broilers

Ingredient	Diets (% inclusion levels of test ingredients)			
	T_1	T_2	T_3	T_4
White maize	60.00	-	-	-
MSBDG	-	20.00	20.00	20.00
Jackbean	-	15.00	20.00	25.00
Cassava root meal	-	25.00	20.00	15.00
Calculated nutrient analysis (%)				
Crude protein	19.56	21.75	22.71	23.67
Crude fibre	4.27	6.80	7.05	7.31
Ether extract	4.04	3.46	3.67	3.60
Calcium	1.26	1.38	1.37	1.37
Phosphorus	0.81	0.94	1.06	0.97
ME (Kcal/Kg)	2906.89	2549.95	2532.41	2514.88

Each data contained 14% soybean meal, 10% wheat offal, 4% palm kernel cake, 3% fishmeal, 2% *Alchornea* leaf meal, 3% blood meal, 2% bone meal, 1% oyster shell, 0.25% methionine, 0.25% lysine, 0.25% vitamin / mineral premix, 0.25% common salt. Vitamin / mineral premix contributed the following per kg of feed: vitamin A, 5,000,000 I.U.; vitamin D_3, 1,000,000 I.U.; vitamin E, 16.0g; vitamin K, 1.0g; vitamin B_1, 0.509 mg; Riboflavin, 2 - 4 mg; pyridoxine, 0.35 mg; niacin, 3.5 mg; biotin, 0.005 mg; choline chloride 30.0 mg; folic acid 0.1 mg; vitamin B_{12}, 0.002 mg; vitamin C, 2.50 mg; manganese, 10.0 mg; zinc, 4.5 mg; Copper 0.20 mg; iron 5.0 mg; methionine 2.0 mg; calcium panthothenate 1.0 mg.

RESULTS AND DISCUSSION

The result of the proximate values of maize/sorghum-based brewers' dried grains, jackbean, cassava root meal and maize is shown in Table 2. The crude protein of MSBDG (19.14%) was lower than the crude protein of jackbean (22.84%). The crude protein value of maize (9.0%) was higher than that of CRM (3.59%). The crude fibre values of MSBDG, JB and CRM were 9.45%, 8.80% and 3.70% respectively; and each of these was higher than the crude fibre value of maize (2.8%).

Table 2 - Proximate Composition of Maize/Sorghum-based brewers' dried grains (MSBDG), Jackbean (JB), Cassava Root Meal (CRM) and Maize

Nutrient	MSBDG	JB	CRM	Maize
Moisture content (%)	12.80	13.05	12.25	10.50
Dry matter (%)	87.20	86.95	87.75	89.50
Crude protein (%)	19.14	22.84	3.59	9.0
Crude fibre (%)	9.45	8.80	3.70	2.8
Ether extract (%)	7.08	2.08	0.70	4.2
Ash	4.30	4.00	2.40	1.5
Nitrogen free extract (%)	47.23	49.23	77.36	72.0
HCN (mg / 100g)	-	-	2.81	-

The crude protein content of cracked, soaked and cooked jackbean (22.84%) was lower than 25.5% which is the CP value for jackbean cooked for 1 hour as reported by Udedibie (2003). The cassava root meal is lower than MSBDG and Jackbean in both crude protein and crude fibre but higher in metabolize energy.

The feed intake of the control birds (T_1) was similar (P>0.05) to that of the T_4 birds. The feed intake of bird on T_3 was significantly (P<0.05) higher than that of T_1 and T_4. There was a general increase in feed intake values arising from the various combinations of MSBDG, JB and CRM, and this reflected the lower energy values of these diets relative to the control – a condition which encouraged increased feed intake to enable the birds meet their energy requirement (Hill and Dansky, 1954). However, the drop in feed intake of the group on T_4 despite its least energy value could be attributed to its high fibre (7.31%) which was quite above the recommended value of 5.5% for finisher broilers (Obioha, 1992).

There was no significant (P>0.05) difference in average daily weight gain between T_1 and T_2 birds. The birds on T_3 and T_4 had significantly (P<0.05) lower daily weight gain than the control (T_1) (Table 3). The reason for the similarity in the daily weight gain of the birds on T_1 and T_2 could be associated with the fact that the crude fibre content of T_2 was not high enough as to impede feed consumption and utilization; thus the birds were able to compensate for low energy value of the diet by increasing consumption. The feed conversion ratio of T_1 birds was significantly (P<0.05) lower and better than that of T_2, T_3 and T_4 birds, which were similar. This agrees with the report of Afolayan et al.

To cite this paper: Uchegbu, M.C., Herbert, U., Ogbuewu, I.P., Nwaodu, C.H., Esonu, B.O. and Udedibie A.B.I. 2011. Growth performance and economy of replacing maize with combinations of brewers' grains, jack bean and cassava root meal in broiler finisher rations. *Online J. Anim. Feed Res.*, 1(5): 160-164.
Journal homepage: http://www.ojafr.ir

(2009) that birds on lower energy diet would have poor feed conversion efficiency when compared with high energy diet whether in wet, hot or cold season. Birds on low energy diet and high fibre consume more water than those on high energy diet across the three seasons, thus explaining its lower feed intake, lower metabolizable energy as water is consumed at the expense of feed. The number of birds that died in T_1 and T_4 was 1 each, and no death recorded in T_2 and T_3. The mortality records were quite low and were not ascribed to the experimental diets.

Table 3 - Performance of finisher broiler fed combinations of maize/sorghum-based brewers' dried grains, jackbean and cassava root meal

Parameters	T_1	T_2	T_3	T_4	S.E.M
Mean initial body weight (kg)	0.47	0.47	0.47	0.49	0.012
Mean final body weight (kg)	2.17^a	2.04^{ab}	1.97^b	1.93^b	0.053
Daily body weight gain (kg)	1.70^a	1.55^{ab}	1.50^b	1.45^b	0.054
Daily feed intake (g)	48.57^a	44.29^{ab}	42.86^b	41.42^b	1.547
Feed conversion ratio (g feed/ g wt.)	2.80^b	3.41^a	3.56^a	3.43^a	0.148
Mortality	1	-	-	-	-

^{a,b} Means in the same row bearing different su1perscript are significantly ($P<0.05$) different; S.E.M - Standard error of mean.

In terms of feed cost required to produce one kilogram of meat, T4 diet had the least cost of production of N195.58 per kg meat produced while the T_1 (control) recorded the highest cost of N214.50 per kg meat produced (Table 4). Therefore, based on the cost of feed required to produce 1kg meat, the various combinations of MSBDG, JB and CRM which resulted in diets T_2, T_3 and T_4 produced 1kg broiler meat at rates 6.17%, 3.71% and 8.82% cheaper for T_2, T_3 and T_4 than the maize based diet (T_1).

Table 4 - Feed cost evaluation of various combinations of MSBDG, JB and CRM in broiler finisher diets

Parameters	T_1	T_2	T_3	T_4
Kg feed / kg weight gain	2.89	3.41	3.56	3.43
Cost of feed (US$ / Kg) [1]	0.53	0.42	0.41	0.41
Cost of feed / kg weight gain (US$)	3.42	3.83	3.97	3.84
Cost reduction (%)[2]	0.00	6.17	3.71	8.82

[1] Cost of feed was determined based on prevailing ingredient costs. [2] Relative to the control.

CONCLUSION

This experiment has revealed that maize could be replaced completely with maize/sorghum-based brewers' dried grains, jackbean and cassava root meal at 20 : 15 : 25 for finisher broiler, producing similar growth rate to the control diet. The superiority of maize-based diet (control) over 20 : 15 : 25 as evidenced in lower feed intake and lower feed conversion ratio is compensated for by the lower feed cost required to produce 1kg weight of broiler meat using MSBDG/Jackbean/CRM combination.

REFERENCES

Aduku AO (1993). Tropical Feedstuff Analysis Table. Department of Animal Science, Faculty of Agriculture, Ahmadu Bello University, Samaru, Zaria, Nigeria.

Afolayan M, Dafwaang II, Omage JJ and Afolayan MO (2009). Performance of broiler finishers fed on high energy diet and low energy diet during the wet, hot and cold season. Proceedings of the 3rd Nigeria International Poultry Summit 22 – 26 February 2009, Abeokuta Ogun State, Nigeria, pp. 12-15.

FAMWR (2008). Federal Ministry of Agriculture and Water Resources. National Policy on Agriculture for National Food Security, 2008.

Good D (2006). What next for corn prices? Weekly outlook, University of Illinois, Farmdoc. http://www.farmdoc.uiuc.edu/marketing/weekly/html/050806.html.

Hill FW and Dansky LM (1954). Studies on the energy requirements of Chicks. Poultry Science, 33: 1034 -1041.

Irvine FR (1979). West African Crops. Oxford University Press, U.K, pp. 23.

Iyayi EA (2009). Prospects and challenges of unconventional poultry feedstuffs. Proc. of the 3rd Nig. Int. Poult. Summit 22 – 26 February 2009, Abeokuta, Ogun State Nigeria.

Obioha FC (1992). A guide to poultry production in the Tropics. Acena publishers, Enugu, pp. 23.

Obioha FC, Ngoka DA, Alozie S and Okpokiri A (1984). The value of methionine and palm oil supplementation in cassava based diet (unpublished data).

Odukwe CA (1994). The feeding value of composite cassava root meal for broiler chicks. PhD Thesis, Department of Animal Science, University of Nigeria Nsukka, pp. 243.

Okeke GC, Obioha FC and Udogu AE (1985). Comparison of detoxification methods of cassava-borne cyanide. Nutritional Reports International, 32: 139 -147.

To cite this paper: Uchegbu, M.C., Herbert, U., Ogbuewu, I.P., Nwaodu, C.H., Esonu, B.O. and Udedibie A.B.I. 2011. Growth performance and economy of replacing maize with combinations of brewers' grains, jack bean and cassava root meal in broiler finisher rations. *Online J. Anim. Feed Res.*, 1(5): 160-164.
Journal homepage: http://www.ojafr.ir

Sayre R (2007). Transgenic strategies for reducing cyanogens levels in cassava food. Cassava cyanide Disease Network, 7: 1-2.

Sonaiya EB and Omede TA (1983). Cassava meal and cassava peel meal in diets of growing pigs. Animal Feed Science Technology, 8: 211-220.

Steel GD and Torrie JH (1980). Principles and procedures of statistics (2nd edn.). McGraw hill Books Co. Inc. New York.

Uchegbu MC (1995). Studies on the nutritive value of maize/sorghum-based brewers' dried grains for broilers. M.Sc. Thesis, Federal University of Technology, Owerri, Nigeria. Pp. 124.

Uchegbu MC, Okoli IC, Anyanwu CE, Etuk EB, Esonu BO and Udedibie ABI (2004). Performance, carcass and organ characteristics of finisher broilers fed graded levels of raw *Napoleona imperialis* seed meal. Livestock Research for Rural Development 16. http://www.cipar.org.co/lrrd16/6/uche.16041.htm

Udedibie ABI (2003). In search of food: FUTO and the nutritional challenge of canavalia seeds. Inaugural lecture series 6 delivered at the Federal University of Technology Owerri. Imo State, Nigeria.

Udedibie ABI and Emenalom OO (1993). Preliminary observation on the use of maize/sorghum based brewers dried grains fortified with palm oil for finishing broilers. Nigerian Journal of Animal Production, 20: 104 - 110.

Udedibie ABI, Anyaegbu BC, Onyechekwa GC and Egbuokporo OC (2004). Effects of feeding different levels of fermented and unfermented cassava fiber meals on performance of broilers. Nigerian Journal of Animal Production, 31: 211 - 219.

To cite this paper: Uchegbu, M.C., Herbert, U., Ogbuewu, I.P., Nwaodu, C.H., Esonu, B.O. and Udedibie A.B.I. 2011. Growth performance and economy of replacing maize with combinations of brewers' grains, jack bean and cassava root meal in broiler finisher rations. *Online J. Anim. Feed Res.*, 1(5): 160-164.
Journal homepage: http://www.ojafr.ir