MAXIMIZING THE ENERGY VALUE OF CASSAVA ROOT MEAL FOR BROILER NUTRITION IN THE HUMID TROPICS

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Abstract

A 49 day feeding trial was conducted with 243 Early Strain Broiler chicken to evaluate the substitution value of cassava flour for maize, with or without enzyme supplement (smart choice-enzyme). These chicks were randomly allocated to nine dietary treatment ($T_1$0%, T_2, 25%; T_3 25% + enzyme; T_4, 50%, T_5, 50% + enzyme; T_6, 75%; T_7, 75% + enzyme; T_8, 100%, and T_9 100% + enzyme) groups. Each treatment has a total of twenty-seven (27) birds. This was replicated three (3) times with nine (9) birds per replicate in a Completely Randomized Design (CRD). However, the results of the study showed that, in the growth performance, the birds fed 1, 2, 3 and 5 respectively were comparable and significantly ($P<0.05$) higher than those of diets 4,6,7,8, and 9 respectively in mean final body weight and average body weight gain. More so, enzyme supplementation significantly ($P<0.05$) reduced feed intake when compared with non-enzyme supplement. Also feed conversion ratio was shown to be significantly higher in enzyme supplementation (T_3, T_5 T_7 and T_9) than values obtained from the non-enzyme supplemented diets (T_1, T_6 and T_8) except T_2. The economics production, the cost per kilogram of feed consumed was not affected by the experimental diet though cost of weight gain were statistically ($P<0.05$) better in diets 3, 2, 1, 7 and 5 respectively when compared with other dietary groups (6, 8 and 4 respectively). The use of cassava flour as a substitute for maize showed a better profit margin when compared with the control diet. It was concluded that cassava flour with or without enzyme can economically replace 50% maize in the diets of broilers with no deleterious effects on production performance of the birds.

Key words: Enzyme; supplementation; cassava flour meal; Broiler chickens; humid tropics

Introduction

Poultry production in Nigeria is being negatively affected by high cost of feed ingredients and poor availability of conventional feed stuff, especially, the protein and energy sources [Okoya, 2002]. This has been attributed to competition between human beings, industries and monogastric farm animals. There is need to exploit cheaper energy sources to replace the expensive cereals for livestock production, so as to relieve the food-feed competition between man and its animals in the future. Cassava flour and cassava by-products (fiber, peels, chip and leaves) have proven to be very appropriate for this purpose [kana *et al,.2014*]. The use of cassava in commercial poultry feeding in Nigeria has been limited by the conservative attitude of feed millers to the use of locally available alternatives and lack of proper technology to produce guaranteed high quality cassava products that can meet the nutritional needs of these fast growin monogastric livestock for satisfactory productivity on a commercial scale.

The use of cassava for livestock feeding has been advocated by many researchers and the Federal Government of Nigeria is presently promoting and supporting the production and it's processing for the livestock feeds, industrial use and food for the teaming populace. The objective of this study is to investigate the utilization of dietary energy as well as performance of broiler chickens on diets based on cassava flour with or without enzyme supplements and evaluate the cost efficiency of these diets for broiler production.

Materials And Methods

Experimental Animals and their Management

Two hundred and forty three (243) day old-chicks of Early Strain were used for the experiment. Their individual weights were measured, after which they were randomly assigned to the nine (9) dietary treatments in a One-Way Anova, but in a Completely Randomized Design (CRD). The birds were fed and watered *ad libitum*. Routine management practices were maintained, while vaccines and drugs were administered appropriately.

Table 3.1: Composition of experimental Diets fed broiler chickens from (0-7 weeks)

INGREDIENT	DIET 1	DIET 2	DIET 3	DIET 4	DIET 5	DIET 6	DIET 7	DIET 8	DIET 9
Maize	60.30	45.23	45.23	30.15	30.15	15.08	15.08	-	-
Soybean meal	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30,00	30,00
Cassava flour	-	15.08	15.08	30.15	30.15	45.23	45.23	60.30	60.30
Fishmeal (imported)	5.00	5.00	5.00	5.00	5,00	5.00	5,00	5.00	5.00
Bone meal	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Oyster shell	1.0	1.0	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Vit. Premix	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Methionine	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Lysine	0.10	0.1	0.10	0.10	0.10	0.10	0.10	0.10	0.10
-/+enzyme	-	-	0.10	-	0.10	-	0.10	-	0.10
Total	100	100	100	100	100	100	100	100	100
Calculated composition:									
Crude protein %	22.02	21.12	21.12	20.22	20.22	19.49	19.49	18.409	18.409
ME (kcal/kg)	2907.13	2864.92	2864.92	2822.71	2822.71	2788.94	2788.94	2.738.29	2.738.29
Protein:Calorie ratio	1:132	1:136	1:136	1:140	1:140	1:143	1:143	1:149	1:149

Vit. Premix Composition:VitA,10000 IU; VitD,28000 IU;VitE,35000 IU; VitK,1900 mg;VitB $_{12}$ 19_{mg}; Riboflavin, 7000mg; Pyridoxine, 3800mg; Thiamine,2200mg; D -Pantothenic acid, 11000mg; Folic acid, 1400mg; Biotin,113mg; Cu,8000mg; Mn,64000mg; Choline,475000mg; Methionine,50000mg; BHT,5000 mg;Spiramyin,5000m

Results and Discussion

The results shown in tables 1 and 2 indicated significant ($P<0.05$) effect on the mean final body weight, final body weight gain, daily body weight gain, total fed intake, daily feed intake, feed to gain ratio, cost per kilogram weight gain, cost of production, revenue and gross margin. The performance of birds fed diets 1,2, 3 and 5 respectively were comparable but significantly ($P<0.05$) higher than those fed diets 4, 6,7, 8 and 9 respectively in final body weight and final body weight gain. Enzyme supplementation however, significantly ($P<0.05$) improved weight gain and reduced the quantity of feed required for a unit weight gain, although it has no effect on feed intake. These improvement in weight gain with enzyme supplement with a relatively same feed intake across dietary treatments resulted in significant ($P<0.05$) reduction in the quantity of feed required to gain a unit weight by broilers. The feed-to-gain ratio values were statisticaly the same for enzyme supplemented diets, but showed significant ($P<0.05$) difference in the values obtained from the non-enzyme supplemented diets. Except in diet 2 which had a similar value with enzyme supplemented.

The cost of feed consumed decreased as the substitution level of maize with cassava flour meal increased from 0-100%, though the inclusion of enzyme supplemented significantly ($P<0.05$) improved in diets 3,2,1,7 and 5 respectively but no difference was observed among the treatments, but diets 6, 8 and 4 respectively showed significant ($P<0.05$) difference among the treatments. When considered the cost of feed per kilogram of weight gain, it is observed that replacing maize with cassava flour meal did not optimized good monetary returns. This is in consonance with [Ojewola *et al.,2006* and Kana *et al.,*2014]. The significant reduction of cost of production when cassava flour meal was used as substitute for maize could be due to the inclusion of enzyme supplementation. The revenue and net profit showed significant ($P<0.05$) difference among the treatments. Diets 1, 5 and 4 respectively gave a better profit margin when compared with other diets. Therefore, at 50% substitution level of cassava with or without enzyme supplementation, a substantial profit margin was obtained.

Conclusion

From the findings of this study, it is obvious that broilers could be fed with cassava flour meal as substitute for maize up to 100% level of inclusion without significant adverse effect on growth, feed conversion ratio, and weight gain of broiler chickens. The results of the study also showed that feeding broilers with cassava flour meal up to 50% (with or without enzyme supplementation) inclusion level was more economical than maize. In conclusion, there is no doubt that cassava can replace maize as an energy source for animal feeding, where ever it is produced in commercial quantities.

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The results of cassava flour meal with or without enzyme supplementation on growth performance and economics of production of broilers are presented in tables 1 and 2.

Table 1; The Performance characteristics of Broiler chickens fed varying levels of cassava flour me al with or without enzyme supplementation

Parameters	Tx1	Tx2	Tx3	Tx4	Tx5	Tx6	Tx7	Tx8	Tx9	SEM
Initial body weight (g)	51.00	51.33	51.667	50.667	51.667	52.000	50.667	53.667	50.667	1.111
Final body weight (g)	1885.1831^{b}	1688.890^{b}	1666.663^{b}	1355.551^{a}	1629.6300^{b}	1255.553^{a}	1203.7071^{a}	11.33.331^{a}	1231.480^{a}	90.787
Average body wt. gain (g)	1834.185^{b}	1639.557^{b}	1614.997^{b}	1304.890^{a}	1578.2967^{b}	1203.553^{a}	1153.040^{a}	1082.663^{a}	1180.663^{a}	90.621
Daily body wt. gain (g)	37.80^{b}	33.420^{b}	32.960^{b}	26.630^{a}	32.210^{b}	24.563^{a}	23.530^{a}	22.097^{a}	24.097^{a}	1.849
Total feed intake (g)	1134.98^{d}	961.83^{bc}	939.53^{bc}	1079.36^{cd}	1064.25^{cd}	915.34^{bc}	694.633^{a}	789.12^{ab}	720.33^{a}	43.578
Daily feed intake (g)	23.16^{f}	19.53^{de}	19.18^{cd}	22.03^{ef}	21.54^{def}	18.68^{bc}	14.17^{a}	16.10^{ab}	14.70^{a}	
Feed conversion ratio	1.62^{bc}	1.73^{c}	1.73^{c}	1.21^{a}	1.49^{abc}	1.32^{ab}	1.64^{bc}	1.38^{abc}	1.64^{bc}	0.121

^{abcd} Mean values in a row with different superscripts are significantly different (P<0.05). SEM -standard error of mean

Table 2; Economics of Production of Broiler chickens fed varyi ng levels of cassava flour meal with or without enzyme supplementation

Parameter	Tx1	Tx2	Tx3	Tx4	Tx5	Tx6	Tx7	Tx8	Tx9	SEM
Cost/kg feed (N)	110.260	108.460	111.260	106.640	109.440	104.840	107.640	105.020	105.820	13.090
cost of wt. gain (N)	178.95^{bc}	188.01^{c}	192.4767^{c}	130.33^{a}	162.68^{ab}	138.04^{ab}	176.89^{bc}	142.171^{ab}	173.19^{ab}	5.669
Cost of prod(N)	280.24^{cd}	273.30^{cd}	274.40^{cd}	285.17^{d}	286.41^{d}	265.89^{bc}	244.74	251.25^{ab}	246.19^{a}	600.00
Revenue (N)	1100.20^{b}	982.40^{b}	969.00^{b}	783.00^{a}	947.00^{b}	722.00^{a}	691.70^{a}	649.57^{a}	708.50^{a}	54.349
Gross margin (N)	125.33^{d}	104.30^{bc}	104.40^{bc}	115.17^{bc}	116.41^{cd}	95.89^{b}	74.74^{a}	81.25^{a}	76.19^{a}	4.718

^{abcd} Mean values in a row with different superscripts are significantly different (P<0.05). SEM -standard error of mean.