

Effect of replacing maize with composite cassava meal (CCM) on growth and economics performance of rabbit

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Abstract

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A 91 day feeding trial was conducted using twenty (20) weaned heterogeneous breed rabbits of both sexes with initial weight of 225g–500g to evaluate the replacement value of maize for composite cassava meal (CCM) in diet. Five experimental diets were formulated such that the control diet represented as treatment 1 (T₁) contained 100% maize as the major energy source in the diet. CCM replaced 25, 50, 75 and 100% of maize in the other treatments (T₂, T₃, T₄ and T₅ respectively). The rabbits were divided into five treatments of four rabbits each and randomly assigned to the five diets in a completely randomized design with each rabbit serving as replicate. Data collected included weight gain and feed intake, while feed conversion ratio and economics of production were computed. The result revealed that the crude protein (17.78-16.26%) and ether extract (6.79-5.93) content of the diet decreases as level of CCM increased in the diets while crude fibre (12.67-13.88%) content increased with increased level of CCM in the diet. The nutrient compositions of the experimental diets were within acceptable ranges for growing rabbits. The final weight and the total weight gain were not affected by treatment but feed intake significantly increased as the level of replacement increased indicating enhanced acceptability due to CCM in diet. Daily weight gain was also enhanced as the level of replacement of CCM for maize increased. The cost of feed per kg was reduced but the total cost of feeding was increased as the level of replacement increased. The cost of production was minimized and profit was maximized at 100%, when 100% of the maize was replaced by CCM. CCM has no harmful effect on performance of rabbits and the replacement of maize with CCM in diet has reduce the cost of feed per kilogram and maximize profit at 100% level of replacement. Farmers can include composite cassava meal in diet of rabbits to replace 100% of maize as major source of energy in diet.

Keywords: Rabbit, cassava, unconventional, foliage, maize

Introduction

Meat is greatly cherished as food for human consumption. To maximize the amount of meat obtained from any animal involves a science and art of management and nutrition which can provide the animal with optimum environmental conditions and with essential nutrients for various physiological activities. These require large quantities of material, money, effort and time. In livestock production, feed

constitute a very important component and the high cost of feed (Abeke, 2005) or lack of these feed resources have often imposed a major constraint on the development of animal production in Nigeria (Shaahu *et al.*, 2008). Cereal grains and legume seeds used in compounding feeds fluctuates both in price and quantity and are also in high demand for human consumption and industrial use. This has led to the search for alternative feedstuffs that have high

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potential, easily available, cheap and rarely consumed or eaten by man as opposed to conventional feed ingredients.

Cassava is a root crop planted mostly for its root for human consumption and as industrial raw material (e.g. Starch). Cassava appears to be the best possibility for overcoming these chronic high feed cost in the livestock industry. Its cultivation requires no special expertise that applies to cereal production (e.g. Maize, wheat, etc.) And, with minimal input it yields about 10.83t/ha annually. Currently, Nigeria is the largest world producer (FAO 2002). The roots of cassava are usually processed by peeling, followed by grinding and compressing to remove water and reduce its cyanide (HCN) content. It contains an energy value of about 3.65 Kcal/g ME comparable to that of maize (3.66 Kcal/g ME). The foliage (leaves + tender stems) is a good source of dietary ash and vitamins (Akinfala *et al.*, 2003). Cassava processing for human consumption and industrial use has resulted in accumulation of huge wastes in terms of its leaves, discarded stems, peels, sieviates etc., which constitute environmental hazards.

The search for solutions to the problem of availability of animal protein for the general public cannot be confined to nutrition and environment alone, but must also take into consideration the type of livestock. Rabbits have unique qualities like fast growth rate, short gestation length, early sexual maturity, high prolificacy and ability to rebreed shortly after parturition. The meat is appetizing and highly nutritious which makes rabbits the animals of choice for improved meat quality and availability through animal production.

The study is aimed at evaluating the effects of composite cassava meal (CCM) on growth performance and production economics of growing rabbits. If composite

cassava meal will find relevance in rabbit feeding, it will remove the stress of peeling, reduce the amount of waste from cassava processing, and provide an alternative feed stuff to replace maize in rabbit diet.

Materials and methods

The study was conducted at the Livestock Teaching and Research Farm, University of Agriculture, Rabbit Unit Makurdi, Benue State, Nigeria. Twenty mixed breed rabbits were randomly allocated to five dietary treatments with one rabbit as a replicate in a completely randomized design. The initial weights of the rabbits were balanced such that they had no significant difference. The rabbits were housed and served feed and water individually in cages and the feeding trial lasted for 91 days.

The cassava tubers were purchased and leaves with petiole obtained from a peasant farmer at Kanshio village, Makurdi. Cassava tubers were harvested, left for about 12 hours, washed to remove sand and it reduced silicate. The unpeeled cassava tubers were chipped, sundried for 2 weeks (to reduce hydrogen cyanide level) and crushed. The leaves with petiole were also sundried for 7 days and crushed. The crushed cassava tubers, and leaves with petiole were mixed in a ratio of 2:1 respectively and 1% palm oil was added to the mixture to reduce the dustiness and also boost the energy level producing what is referred to as composite cassava meal (CCM). The full fat soya bean was processed by toasting for 30 minutes and crushed. Five experimental diets were formulated with treatment one (T1) as the control diet with maize grain as the major energy source and without CCM. T2, T3, T4 and T5 diets respectively had maize replaced with CCM at graded levels of 25%, 50% 75% and 100%. (Table1). Data collected included weight gain and feed

intake, while feed conversion ratio and economics of production were computed.

Table 1 : Ingredient percentage and proximate composition of experimental diets

Ingredients (%)	T1 (0%CCM)	T2 (25%CCM)	T3 (50%CCM)	T4 (75%CCM)	T5 (100%CCM)
Maize	24.58	19.66	12.29	4.92	-
CCM	-	4.92	12.29	19.66	24.58
Maize offal	12.29	12.29	12.29	12.29	12.29
Rice offal	24.58	24.58	24.58	24.58	24.58
BDG	12.29	12.29	12.29	12.29	12.29
FFSB	23.44	23.44	23.44	23.44	23.44
Bone ash	2.00	2.00	2.00	2.00	2.00
Salt	0.50	0.50	0.50	0.50	0.50
Premix	0.30	0.30	0.30	0.30	0.30
Total	100.00	100.00	100.00	100.00	100.00
Crude protein	17.78	17.67	17.12	16.60	16.26
Crude Fibre	12.67	12.91	13.27	13.63	13.88
Ether extract	6.79	6.67	6.39	6.12	5.93
Ash	6.64	6.73	6.35	6.97	6.92
Moisture	6.35	6.48	5.89	6.04	6.13
ME (Kcal/kg)	2771	2690	2663	2863	2837

CCM=Composite cassava meal, CP=crude protein, EE=Ether extract, CF=Crude fibre, BDG=brewer dried grain, FFSB=Full fat soya bean.

The production data obtained were subjected to one way analysis of variance, using Minitab Statistical Software and where ANOVA indicated significant treatment effect, means were separated using Fisher's method.

Results and discussion

The nutrient content of the experimental diets are shown in Table 1. The moisture content of the experimental diets was less than 10% which is acceptable for concentrate diets. The dietary Crude Protein ranged from 16.26 (T5) to 17.78 (T1), Crude Fibre from 12.67 (T1) to 13.88% (T5), Ether extract from 5.93 (T5) to 6.79% (T1) and Ash from 6.64 to 6.92%, the moisture content and metabolizable energy did not follow a definite trend among the experimental treatments. The Crude protein and ether extract content of the diet decrease as level of CCM increased

in the diets while crude fibre content increased with increasing level of CCM in the diet. The nutrient compositions of the experimental diets were within acceptable ranges for growing rabbits (Thacker, 1956; Lebas (1977; Omole, 1982; Anugwa *et al.*, 1982; Aduku and Olukosi, 1990 and Fielding, 1991).

Table 2 shows the growth performance of rabbits fed the experimental diets. The final weight and total weight gained were similar ($P>0.05$) among treatment indicating lack of adverse effect on any of these parameters.

The final weights which ranged from 1347.0-1693.8g agrees with the values of Omole and Onwudike (1982) that fed growing rabbits on graded levels of cassava meal and supplementary palm oil which ranged from 1470.7-1969.3g. T5 had the highest final weight which indicate that even at complete replacement of maize for CCM, the effect of the diet on performance were rather positively enhanced.

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Table 2: Growth performance of growing rabbits fed with graded levels of composite cassava meal in diet

Parameter (%)	T1 (0%CCM)	T2 (25%CCM)	T3 (50%CCM)	T4 (75%CCM)	T5 (100%CCM)	SEM
Initial weight	306.25	300.00	300.00	281.25	325.00	44.43
Final Weight	1431.30	1347.50	1361.30	1483.30	1693.80	113.97
Total weight gain	1100.00	1047.50	1061.30	1208.70	1368.80	106.83
Daily weight gain	12.36 ^b	11.40 ^b	11.64 ^b	13.37 ^{ab}	16.02 ^a	1.12
Daily feed intake	48.24 ^a	51.02 ^{ab}	62.05 ^{abc}	64.59 ^{bc}	74.36 ^c	5.02
FCR	3.90 ^a	4.47 ^{ab}	5.33 ^b	4.73 ^{ab}	4.66 ^{ab}	0.82

A,b,c=Mean values with different superscripts within a row differ significantly (P<0.05), mean value with similar superscript within are row not significantly (P>0.05).SEM= Standard Error of mean, FCR= Feed Conversion Ratio.

There was an increasing trend in the daily feed intake from rabbits fed the control diet (48.24) to those fed T5 diet (74.36). The daily feed intake was affected significantly (P<0.05) by the experimental diets. This implies that the increased levels of composite cassava meal had enhanced acceptability which increased feed intake to 74.36g/day. Feed intake of rabbits fed the CCM based diets on average was higher than that of rabbits fed the control diet. Daily feed intake increased as the level of inclusion of CCM increased in the diets and was significantly (P<0.05) higher than the control at inclusion levels beyond 50%. This could be the result of the palatability of the CCM. However, the feed intake by rabbits in this study was comparatively lower than 104.88g per rabbit per day for rabbit fed complete pullet diet (Asuquo, 1993). The difference could be due to the physical form of the diet which may have affected acceptability and nutrient utilization. The daily feed intake of rabbits fed T5 diet agrees with the results of Omole and Onwudike (1982) who fed growing rabbits with cassava peel meal and obtained a range (72.50-75.18g) above the other treatments in this study. It is known that rabbit eat more feed to make up for its energy requirement when fed a low energy

diets, however, in the present study, the diet with higher energy levels were consumed more than the lower energy diets. This shows that energy level was no longer the determining factor for feed intake but rather palatability/acceptability of the diets.

Rabbits fed T5 diets had the highest daily weight gain which was similar to those of T4 but significantly higher than those rabbits fed the other diets. The daily weight gain of rabbit fed the control diet and those fed 25% and 50% CCM respectively, were similar, but those fed the control diet significantly (P>0.05) gained less weight than those fed T4 and T5 diets respectively. The daily weight gain of these rabbits were lower and the trend is different from that observed by Oyewole *et al.* (2013) who fed yam peel meal in diets to rabbits and observed decreasing daily weight gains of the rabbits as the level of replacement of the yam peel meal for maize was increased. This is an indication that CCM is more acceptable to replace part or all of maize in a diet of rabbits than yam peel meal. The result of this study is however, similar to the 14.52-16.93g daily weight gain of rabbits fed normal diets at different times of the day (Ojebiyet *et al.*, 2013).

Rabbits fed T1 diet were similar (p>0.05) to those fed T3, T4 and T5 diets, but differs

significantly ($p < 0.05$) and were better than those fed T2 in the efficiency to which they utilized the respective diets. The values of feed conversion ratio falls between 3.90-5.33 which is a little above the finding of Harris *et al.*, (1981) who fed cassava leaf-based diets to rabbits and observed an average value of 3.38. Adegbola and Okonkwo (2002) fed rabbits with varying levels of cassava leaf meals and observed the feed conversion ratio of 3.13 to 5.25 while Oyawole and Nelson (1998) reported a range of 2.93-4.20. Omole and Onwudike (1982) who fed rabbits with cassava peel meal obtained a FCR of 3.25-5.64g.

Table 3 shows the economics of production of experimental rabbits. The cost per kg diet was reduced as the level of replacement of CCM increased from 63.16-60.70/kg diet. This result indicates that the cost of the CCM is lower than that of maize. The feed cost per kilogram weight gain and the total cost of feeding the control diet to rabbits were minimal compared to the feeding of rabbits with CCM diets. This is largely a function of the difference in the palatability of the feed, feed intake and utilization. The cost of production increased as the level of CCM increased in diet and ranged from 1,226.64-1360.94 (T1-T5 respectively).

Table 3: Economics of production of rabbit fed graded level of composite cassava meal in diet

Parameters (%)	T1 (0%CCM)	T2 (25%CCM)	T3 (50%CCM)	T4 (75%CCM)	T5 (100%CCM)	SEM
Total feed intake (g)	4389.80 ^c	4649.0 ^{bc}	5646.50 ^{abc}	5877.70 ^{ab}	6766.30 ^a	455.87
Total weight gain (g)	1124.50 ^b	1047.50 ^b	1061.30 ^b	1208.70 ^{ab}	1368.80 ^a	106.83
Final weight (g)	1431.30	1347.50	1361.30	1483.30	1693.80	113.97
Feed Cost (Δ/Kg)	63.16	62.67	61.94	61.19	60.70	-
Feed Cost (Δ/Kg)	245.97	278.19	335.05	296.02	297.63	-
Cost of feeding (Δ/rabbit)	276.64	290.47	349.65	359.80	410.94	-
Cost of production (Δ)	1,226.64	1,240.47	1,299.65	1,309.80	1,360.94	-
Revenue	1,717.56	1,617.00	1,633.56	1,779.96	2,032.56	-
Profit (Δ)	490.92	376.53	333.91	470.16	671.62	-

The cost of feeding was implicated as the reason for the difference in the production cost. The rabbits were sold at the rate of 1200.00/kg live weight and rabbits fed 100% CCM as the major energy source in diet yielded the higher profit than those fed 100% maize as the major energy source in diet.

Conclusion

Based on the study, it was concluded that CCM has no detrimental effect on performance of rabbits and the inclusion of CCM in diet to replace maize has reduce the cost of feed per kilogram and maximize profit at 100% level of replacement. Farmers can include composite cassava meal in diet of rabbits to replace 100% of

maize as major source of energy in diet.

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