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Effect of Feeding Unpeeled Cassava Mash as Substitute for Maize in Layers Diet on Economic of Production and Serum Biochemical Indices

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Abstract

The effect of replacing maize with unpeeled cassava mash as energy source in the diet of laying hens was evaluated during the ten weeks of feeding experiment on economic of production and serum biochemical parameters on layers. One hundred and fifty birds that were thirty four weeks old were randomly allotted to five dietary treatment of 30 birds and replicated twice with fifteen birds each. The experiment lasted for 10 weeks in a completely randomized design (CRD). Treatment 1 (100 maize) serve as control, while treatment 2,3,4 and 5 were 25% unpeeled cassava mash, 50% unpeeled cassava mash, 100% unpeeled cassava mash and 25% peeled cassava mash respectively. There was no significant (P>0.05) in economy of production but there was significant (P<0.05) difference in serum biochemical parameters. Economic of production was best in diet 2and serum biochemical fell within the range established for healthy bird. Unpeeled cassava mash can therefore be recommended to poultry farmers to reduce cost of production and maximize profits.

Keywords: *Maize, peel cassava mash, unpeeled cassava mash, Economy of Production serum biochemical parameters.*

1. INTRODUCTION

The search for alternative sources of feed ingredients (especially that of energy source) which are readily available or cheaper has been the concern of poultry farmers. Poultry production in the tropics especially Nigeria are constrained by seasonal feed deficits, high cost, erratic supply of feed ingredients and competition between humans and animals for available feed resources (1). The most commonly used energy source for monogastric animals is maize. Feed is the major component of the total cost of production for meat and egg production in poultry industry. Maize constitute the bulk of the energy source used in compounding concentrate rations. Other grains used to a lesser extent include sorghum, millet, wheat, barley and oats. Maize supplies the bulk energy in animal feed especially for poultry. It is currently expensive and scarce due to low production and higher consumption rates by humans. Maize is also put into numerous industrial uses including production of agro fuel (2), thus diverting maize away from man and animal food chain, and this has led to increase in the cost of maize and consequently increase the cost of poultry feed which is reflected in the high cost of poultry production.

Maize constituted about 40-60% by weight of a balance diet poultry ration but its exorbitant price, pressure by human population and livestock feed millers had dictated the need to find a cheaper alternative energy source for livestock production (3). For these reasons, there is need to look inward for an alternative feed that will be cheap, safe, affordable and can meet nutritional requirement of the animal. In this case, what readily comes to mind is unpeeled cassava mash. Cassava has long been recognized by researches in Nigeria as an appropriate animal feed and has been used as a cheap alternative feed stuff despite its limitation (4). Besides, depending on maize alone as the sole source of dietary energy may be devastating to poultry production, because of the frequent drought and locust attack affecting some maize producing areas (5). 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.

Several researchers (6 and 7) had worked on the potential of cassava meal as substitute for maize in pigs and poultry diets, but their studies centered on the use of flour, peels or leaves with no much work on unpeeled Cassava mash as a substitute for maize in layers diets. Cassava root meal is deficient in protein, essential amino acids, carotene and other carotenoids. Hence, the need to enhance the nutrient profile of cassava meal evolved the development of cassava mash. Cassava (*Manihotesculenta*) is a multipurpose plant that thrives well in the tropics, it is a very good energy source widely grown in Nigeria. It has a wide range of adaptability, resistance to drought and tolerance to poor soils (8). Available literatures on cassava utilization in poultry diets centered on root (9), leaf meal (10) and root sieviate (11). However, there has been suggestion (12) that, it would be preferable to use whole cassava plant to take advantage of high protein content in the leaves, the bulk intender stems and the high energy of the tuberous roots. The level of hydrocyanic acid in cassava limits the use of cassava and its products for livestock feeding (12). According to (13), cyanide levels of100mg/kg have a negative effect on broiler performance and as low as 25mg/kg can have a negative effect on layer production, egg quality and hatchability of the eggs. However, report indicated that proper processing techniques would eliminate the hydrocyanic acid potential of cassava based diets (14). Unpeeled cassava mash could serve as a cheap and alternative source of energy to poultry compared with maize. The current study therefore investigated the effect of feeding unpeeled cassava mash as substitute for maize in layers diet on economic of production and biochemical indices.

2. MATERIALS AND METHODS

2.1. Study Area

The study was conducted at the teaching and research farm, poultry unit of Taraba State College of Agriculture (Latitude 8°53" and longitude 11°23'E) of the equator in the savanna zone of Northern Nigeria (8).

2.2. Cassava processing /Plant Meal Product Development

The cassava plant meal products were developed using the protocol of (15). The cassava used in formulating the diets was harvested and processed in line with above process.

2.3. Management of Experimental Animals

A total of one hundred and fifty (150) birds of a commercial hybrid of egg producing strain chicken (Isa brown) of 34 weeks old were randomly allotted to five (5) dietary treatments. Management was intensive in cages of a two-tier battery in an open sided type of poultry house, thus afforded good ventilation and a drought free environment, stocking rate was three birds per cage unit. The birds were purchased locally and weighed at the beginning and end of the study. The temperature of the pen was between 32^0c and 34^0c. Feed and water were supplied *ad libitum*. Routine and necessary management practices were carried out on the birds as the experiment lasted for ten (10) weeks.

2.4. Experimental Design and Diets

The experiment was conducted in a complete Randomized Design (CRD). There were five dietary treatments with thirty birds each, replicated twice with fifteen birds. Diets were formulated and compounded based on 100kg consisting of four different levels of peeled and unpeeled cassava mash inclusion. Other ingredients were locally sourced from Jalingo main market.

These are the dietary treatments:

Treatment 1 — 100% maize (control)

Treatment 2 — 25% unpeeled cassava mash

Treatment 3 — 50% unpeeled cassava mash

Treatment 4 — 100% unpeeled cassava mash

Treatment 5 — 25% peeled cassava mash

2.5. Chemical Analysis

Proximate analysis of experimental diets was carried out as specified by the Association Official Analytical Chemists (16).

2.6. Economy of Production

Cost per a tray of eggs produced was calculated using feed intake, egg production, feed conversion ratio and cost of feed. Cost of production is the product of cost per kg feed and feed conversion ratio, while feed intake and egg production were used to calculate feed conversion ratio.

2.7. Statistical Analysis

Data obtained were subjected to analysis of variance (ANOVA) using (17) version 21. While the differences between treatments means

were examined by Dun can multiple range of the same package. SPSS 15.0 was used to perform that of serum Biochemical.

3. RESULTS AND DISCUSSION

Table 1 shows the gross composition of the experimental diets, while table 2reveals the proximate analysis of cassava mash (Peeled and Unpeeled). As shown in the table 2, the Dry matter (DM), Crude Protein (CP), Crude Fibre (CF), Ether Extract (EE) and Ash were all better in unpeeled cassava. However, nitrogen free extract (NFE), calcium and phosphorous were better in peeled mash. The higher level of DM, CF, CP and EE in unpeeled mash was due to high levels of these nutrients contained in the peels. This supports the work of (18) that the peels contain a higher levels of CP, EE and Ash. The values obtained falls within the range of 1.5-3.5% reported by (19) for CP, 1.3-7.7%, CF, 0.8- 3.2%, EE, 88.0-94.1% NFE and 1.6% Ash. The proximate analysis of the experimental diets is as shown in Table 3. The crude protein range of 16.38-17.92% is slightly less than the range of 18.00-20.00% recommend by (20),Table 4 revealed the economy of production of the diets. From the table there were no significant difference between means of economy of production. Birds fed diet 2 had the lowest absolute value (₦145.62/kg) of feed and the highest value of (152.91/kg) was recorded in diet 5.Production of diets 1, 3 and 4 were ₦150.50, ₦149.99 and ₦149.07/kg respectively. Cassava diet was considered to be effective in giving good economic returns in the production of eggs. The cost of production of egg of diet 2 was the highest while other cassava based diet yielded reasonable cost of production which can compete favourably with diet 1 (Control), better than diet 5 because of cost of peeling. The good economic gain recorded on diet 2 showed the effectiveness of cassava as a good energy supplier in poultry nutrition, particularly the advantages derivable from feeding unpeeled cassava mash. Other cassava based treatments, 3 and 4gave good economic returns as well though a little below control treatment. This goes to confirm the report of (21) that cassava meal is an excellent energy feed ingredients in the diets of non-ruminant animals which could replace maize or any other cereal upto 40-60% without any adverse effect on the wellbeing of the animal. The cost of formulating rations with cassava meal as the energy source is less than that of the cereal based diets, so it is more economical to formulate or prepare rations with cassava meal as the main energy supplier as the cost of production is minimized. Diet 2 had the highest value of ₦145.62/kg of feed with 68.63% hen day production and it is very economical when compared to other experimental diets and corresponding hen day production as this is more economically viable than other treatments. Diet 2 has the least cost of production (₦145.62) followed by diet 4 (₦149.07) while the highest is recorded in T5 (₦152.91). This was also supported by (22) and (23) that in order to cut down the cost of production, it is necessary to use a less expensive and readily available feed ingredients, in this case unpeeled cassava mash at diet 2. This is also in agreement with (24). All the results obtained here in respect of economic performance are in line with results obtained by (35 and 16). Serum biochemical parameters is as shown in Table 5. The marker enzymes: Aspartate amino transferase (AST) and Alanize Amino transferase differ significantly as the level of unpeeled cassava mash inclusion varied in the diets. The AST: ALT ratio is less than 1 in the control feed (1) and greater than 1 in other experimental diets 2-4 indicating that the internal organs of the chickens might have been slightly distorted. The significant higher value in serum urea as cassava inclusion level increases suggest there is wasting or catabolism of muscle tissue as reported by (25). This means the cassava inclusion levels increase in food, the more the chickens survive of their body reserve. The stability in total protein values in the treatment groups irrespective of the cassava inclusion level suggest that the diet is adequate for the chickens (26).Every other parameters measured are in agreement with those reported by (27) for healthy birds.

Table 1. *The gross composition of the experimental diets*

Ingredients (%)	Dietary treatments				
	1	**2**	**3**	**4**	**5**
Maize	41.9	32.4	22	-	32.4
Unpeeled cassava mash	-	10.0	22	46	-
Cassava mash peeled	-	-	-	-	10.0
Corn bran	13	12	8	5.0	12
PKC	10	10	10	8.4	12

BDG	7.5	5.0	4	-	5
Soya	14	15	17	19	15
Roasted soya	2	4	5.4	10	4
Fish meal	1.5	1.5	1.5	1.5	1.5
Oyster shell	7.5	7.5	7.5	7.5	7.5
Bone	2	2	2	2	2
Premix	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Methionine	0.1	0.1	0.1	0.1	0.1
Calculated energy	2598.5	2600	2599.1	2599.6	2600
Calculated protein	16.7	16.7	16.7	16.6	16.7

Premix per kg supplied 800iu vitamin A, 1200 vitamin D_3, 11mg vitamin E, 2mg vitamin K_3, 7mg riboflavin, 10mg nicotinic acid, 7mg pantothenic acid, 0.08mg cobalamin, 900mg choline, 1.5mg folic acid, 1.5mg biotin, 125mg antioxidant (santoquin) 25mg Fe, 80mg Mn, 2mg Cu, 50mg Zn, 1.2mg I, 0.2mg Co and 0.1mg Se.

Table 2. *Proximate analysis of Cassava mash (Peeled and Unpeeled)*

Parameter of Cassava	Peeled (%)	Unpeeled (%)
Dry matter	86.78	88.65
Crude Protein	1.54	4.06
Crude fibre	1.3	9.95
Ether extract	0.7	1.45
Ash	1.32	3.06
NFE	95.14	81.48
Calcium	0.13	0.18
Phosphorus	0.10	0.09
Cyanide (ppm/mg/kg)	59.4	91.08

Table 3. *Proximate Analysis of the Experimental Diets*

Nutrient Composition (%)	Dietary treatments				
	1	2	3	4	5
Dry matter (DM)	90.62	91.03	90.23	90.00	89.84
Crude Protein (CP)	17.92	16.94	17.50	16.38	17.22
Crude fibre (CF)	3.84	5.65	4.94	5.99	3.68
Ether extract (EE)	3.70	5.20	4.85	4.05	4.78
Ash	9.64	7.87	9.83	6.89	12.24
NFE	64.90	64.34	63.88	66.69	62.10
Calcium	3.92	3.90	3.78	3.82	3.95
Phosphorus	0.65	0.53	0.54	0.64	0.60

Table 4. *Economy of Production*

Parameters	Dietary treatments				
	1	2	3	4	5
Feed intake (g/day)	115.90	108.78	108.87	108.70	109.81
Hen day production (HPD) (%)	70.32	68.63	66.45	67.39	65.87
Cost of feed ₦/(kg)	30.40	28.44	28.51	28.93	28.64
Cost of production ₦/kg	150.50	145.62	149.99	149.07	152.91

Table 5. *Serum Biochemical Parameters of Broiler Chickens Fed Cassava Peel as Main Carbon Source*

	Dietary treatments					
	1	2	3	4	5	6
Sample	A (0%) CPM	B (25%) CPM	C (50%) CPM	D (75%) CPM	E 100%) CPM	S.E.M
Serum urea (mg/dl)	18.82^{a}	23.65^{b}	34.90^{c}	36.85^{c}	53.8^{d}	8.55
Serum total protein (mg/dl)	2.70^{a}	2.80^{a}	3.10^{a}	3.20^{a}	2.80^{a}	0.74
ALT (µ)	5^{c}	15^{b}	26^{a}	27^{a}	29^{abc}	2.34
AST (µ)	10^{a}	12^{a}	19^{ab}	20^{ac}	26^{cd}	2.65
ALT:AST	0.50	1.15	1.22	1.25	1.11	-

^{abcd} means within a row with different superscripts differ significantly different (P<0.05); AST-Aspartate Aminotransferase, ALT-Alamine Amino transferase, CPM-Cassava Peel Leal, S.E.M-Standard Error Mean.

4. Conclusion and Recommendation

The results obtained from the study showed that cassava meal would successfully replace maize as energy source in laying hens with best performance in diet 2 (25%unpeeled cassava mash). The serum biochemical also falls within the established range of healthy birds. It is therefore recommend to be used in layers diet to reduce cost of production and maximize profit.

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