EFFECT OF FEEDING UNPEELED CASSAVA MASH AS SUBSTITUTE FOR MAIZE IN LAYERS DIET ON GROWTH AND EGG PRODUCTION PERFORMANCES.

OLUSIYI, J. A[1*], OJINNAKA, P.E[2]

*[*1,2]Department of Animal Production and Health. Federal University, Wukari*

***Corresponding Author : OLUSIYI, J. A**

ABSTRACT

The study assessed the growth and egg production performances of laying birds fed varying levels of unpeeled cassava mash as substitute for maize. One hundred and fifty (150) birds that were thirty four (34) weeks old were randomly allocated to five dietary treatment of 30 birds each replicated twice with fifteen birds per replicate. The experiment lasted for 10 weeks, unpeeled cassava mash was used at 0%, 25%, 50%, 100% and peeled at 25% in replacement of maize. The proximate analysis of the experimental diets revealed there were similarities in the composition as regards Ether Extracts (EE), Nitrogen Free Extract (NFE), calcium and phosphorous. Also, proximate analysis of cassava mash revealed that crude protein (CP)) Ether Extract (EE), Ash and Cyanide percentage of untreated cassava are greater than peeled but NFE of peeled cassava was greater than unpeeled. Results of performance of birds revealed significant (P<0.05) difference in feed intake but feed conversion (FCR) was not affected by dietary treatment. Hen day production significantly (P<0.05) differs, while egg weight was not significantly affected. It was concluded that 25%, 50% and 100% inclusion levels of unpeeled cassava mash can compete effectively well with 100% maize based diet in supporting egg production and performance and can therefore be used where it is found to be cheaper than maize.

Keyword: *Unpeeled, peeled, cassava, mash, maize, performance, growth.*

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INTRODUCTION:

The major challenge to animal nutritionists is the availability of feed ingredients for the production of livestock feeds. Livestock scientists and nutritionists have been grapping with this challenge over two decades now (1, 2 and 3). The reason being that what most livestock (especially Monogastric) consume as feed is made up of cereal and leguminous grains that man also uses for food and other industrial purposes (4). This development has led to search for their ingredients that will serve the same purpose of providing the much needed energy and protein as long as it does not result in a significant reduction in growth and reproductive performances of the animals they are fed to (5). This challenge is responsible for inadequate production and supply of protein and protein products in Nigeria, consequently resulting to low protein intake compared to the developed countries. In Nigeria, chicken is the most popular type of poultry reared for eggs and table meat in urban, pre-urban and rural areas (6). The importance of egg as source of protein in human nutrition cannot be over-emphasized. Chicken eggs are well established as an excellent source of all essential nutrients for people of all ages. Egg is highly nutritive and it is the nature's most complete food because it contains plenty of protein (well balanced in essential amino acid content) essential vitamins, which the body needs to be strong, active and healthy (7). The major constraint to achieving protein intake sufficiency is lack of adequate supply of major conventional feedstuffs especially maize due to high cost and competition between man and animals. There is therefore need to look for an alternative feedstuff ingredients. One of such important alternative ingredient is Cassava (*Manihot esculenta*). It's 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) Cassava peel is a waste from Cassava root. The peel is obtained by removing the outer cover of Cassava root. It could serve as a source of cheap and alternative source of energy to poultry (broiler and layer inclusive). The peel accounts for between 10-13% of tuber by weight, 5% crude protein (CP) and reasonable amount of minerals (9). There is limitation to its usage due to the presence of anti-nutritional factor-cyanide (HCN). In order to increase acceptability and subsequent utilization of Cassava peel, the HCN content of fresh cassava peels has to be reduced greatly (10). Nigeria now ranked as the world's largest producer of cassava with production capacity of 40 million metric tonnes (11, 12). Therefore, the study was undertaken to determine the effect of feeding unpeeled cassava mash as substitute for maize in layers diets on growth and Egg production performances. Replacing maize with unpeeled cassava mash will go a long way in making animal protein readily available and reduce the cost of production resulting in high profitable operation.

Materials and Methods

Experimental Location

The study was carried out at the Teaching and Research Farm of Poultry Unit of the College of Agriculture Jalingo, Taraba State (Latitude 8°53"N and longitude 11°23"E). East of the equator in the Savannah zone of Northern Nigeria. (8)

Cassava Processing / Plant Meal Product Development

The cassava plant meal products were developed using the protocol of (9). The Cassava used in formulating the diets was harvested and processed according to above process. The tubers were harvested, washed and chipped into pieces.

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 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°C and 34°C. Feed and water were supplied *ad libitum.* Routine and normal management practices were carried out on the birds as the experiment lasted for ten (10) weeks.

Experimental Design and Diets

The experiment was conducted using Completely Randomized Design (CRD), there were five dietary treatment, with 30 birds replicated twice with 15 birds each, diets were formulated and compounded based on 100kg consisting of four different levels of inclusion of cassava peeled and unpeeled mash in a completely randomized design, other ingredients were locally sourced from Jalingo main market.

These are the dietary treatments;

Treatment 1 - 100% of maize (control)
Treatment 2 - 25% unpeeled cassava mash
Treatment 3 - 50% of unpeeled cassava mash
Treatment 4 - 100% unpeeled cassava mash
Treatment 5 - 25% peeled cassava mash

Data collection
Parameters measured for bird performance were feed intake, weight gain, feed conversion ratio, mortality, Hen day production and egg weight.

Chemical Analysis
Proximate analysis of the experimental diets was carried out as specified by the Association of Official Analytical Chemist (14). Nutrients determined were Crude Protein (CP), Crude Fibre (CF), Ether Extract (EE), Ash and Nitrogen Free Extract (NFE) was obtained by difference i.e % NFE=100-(%CP + % CF + & EE + Ash).

Statistical Analysis
All data obtained were analyzed using one – way analysis of variance while the means were separated using (15) and (16).

Results and Discussion
The gross composition of the experimental diets is shown in Table 1, while the proximate analysis of cassava mash (peeled and unpeeled) is shown in Table 2. The nutrient values of unpeeled cassava mash is greater than that of peeled as shown in Table 2. Crude protein (CP), Crude Fibre (CF) and ash almost triple the levels in the peeled mash and this is due to higher levels of these nutrients in cassava peels. However, nitrogen free extract (NFE) of peeled mash is higher than unpeeled mash and cyanide percentage of peeled mash is considerably lower than unpeeled mash Table 3 revealed the proximate analysis of the experimental diets, there were similarities in the composition as regards EE, NFE, calcium and Phosphorous. Diets 3 and 5 containing 50% unpeeled cassava mash and 25% peeled cassava mash with higher protein level. In addition, diet 5 had the highest ash content and the lowest crude fibre content. Protein level ranged from 16.94% in diet 2 to 17.22% in diet 5. The difference in calcium and phosphorous levels of the two mash is relatively small, as the higher levels of CP, EE, and ash was due to high level of these nutrient contained in the peels. This supports the work of (12), that the peels contain a higher level of CP, EE and Ash. The values obtained for these nutrients falls within the range values reported by (13) that cassava contain crude protein 1.5 - 3.5%, Crude fibre 1.3 - 7.7%, Ether extract 0.8 3.2%, nitrogen free extract 88.0 - 94.1% and ash 1.6%. Table 4 shows summary of means of performance of layers fed different dietary treatment. The result of performance characteristics of birds fed diets containing varying levels of cassava mash both peeled and unpeeled is as follows.

Feed Intake (g / bird/day)
Feed intake of' birds fed diets (control) was significantly ($P<0.05$) different from mean values of other treatments except treatment 5 as shown. Treatment 2, 3, 4 and 5 were not significantly different. Daily feed intake ranged from 108.70g to 115.90g, birds fed diet 4 consumed 108.70g which is the lowest compared to values of intake of other diets. The highest feed intake was in T1 (115.90g) which is the control. Diets 2, 3, and 5 recorded 108.78g, 108.87g and 109.81g respectively. The results showed that there were significant ($P<0.05$) differences among the five treatments with respect to feed intake. This is in line with (14) who reported that birds eat/feed primarily to satisfy their energy requirement and do not seem to have taste preference or discriminate against colour. Since the energy values of the five diets were not significantly different from one another, it would thus be expected that the birds fed on diets containing energy level ranged from 2598.50 - 2599.60 Kcal/ME/kg will have almost the same feed intake under the same environmental condition. This is however not so, the significant difference ($P<0.05$) observed among the mean values of the diets with respect to feed intake could therefore be due to the physical structure of the diets. Diet 4 for instance, 100% cassava based mash had a dusty nature, a factor which must have contributed to wastages as against diet 1 which is corn based diets 1 (100% maize mash) which had energy level of 2598.5kcal/ME/kg which was significantly ($P<0.05$) different from feed intake of birds fed diet 4 (100% unpeeled cassava mash) which had energy level of 2599.6kcal/ME/kg

Feed Conversion Ratio (FCR) (Kg/tray)
No significant ($P>0.05$) differences were observed among the treatments. Diets 5 had the highest value of FCR ratio of 5.03, while diet 2 recorded the least value of 4.80. The diet that recorded the poorest feed intake and second highest hen day production recorded the best value of FCR. Insignificant ($P> 0.05$) values recorded for FCR shows that the diets did not significantly affect the FCR in all the treatments. As can be observed FCRs of the five diets were similar, the values were however higher than 2.1 reported by (1), this might be due to depression effect of fibre on digestibility of nutrients (15). The diet with highest egg production recorded value next to the highest FCR and the diet that had the lowest egg production recorded the best efficiency ratio. The reverse situation was caused by feed intake, as FCR in a function of egg production and egg size (1). These characteristics were described by (1) as metric characteristics that are negatively correlated.

Mortality

There were no significant difference between the mean value of mortality rate of birds fed diets 1, 2, 3, 4 and 5 respectively. However, no mortality was recorded for birds fed diet 3. Although, there were no significant among the treatment mean values of mortality. Mortality mean value recorded for layers on diet 1 and 4 was 10:00 while 13:00 and 7:00 were recorded in diets 2 and 5 respectively. No mortality was recorded for diet 3. The mortality could possibly be due to the fact that anti-nutritional factor in cassava, cyanide did not affect the birds and the overall mortality is less than 5% recommended by (1).

Egg Production (Hen-Day Production) (%)

The result of analysis of variance of egg production indicated significant ($P<0.05$) difference among treatments 1 and 5 with diets 2, 3 and 5 being not affected ($P>0.05$) from each other and diets 2, 3, 4 and 5 were not also significantly different. Birds on diet 1 (control) had the highest egg production mean value of 70.32 + 1.29 while the diet had the least mean value of 65.87. The values of diets 2, 3 and 4 were 68.63 + 1.11, 66.45 + 0.94 and 67.39 + 1.82 respectively. The result on percentage egg production indicated significant ($P<0.05$) difference between egg production of birds fed 100% maize based mash (diet 1) and 25% cassava peeled mash. However, there were no significant among mean values of egg production of birds fed cassava based diets. This result does not contradict the work of (16) and (17) who observed that there is a line or relationship between energy value of diets and efficiency of egg production. Since there were no significant difference between the energy levels of the four cassava based diets, there were no significant differences between the mean values of egg production of the four dietary treatments.

Egg weight (g)

As shown in Table 4, the means of birds fed diets containing cassava mash peeled and unpeeled (diets 2, 3, 4 and 5) were not significantly different from the control (diet 1) which had 100% maize inclusion level. The inclusion level of cassava mash therefore had no significant effect on the egg weight. The largest egg size was recorded for diet containing 50% of unpeeled cassava mash diet 3. (57.25g) and diet 4 (100% unpeeled cassava mash) had the lowest value of 56.25g. The egg sizes range from 56.25 to 57.24g. The average weight for the diets 1-5 were 56.84, 57.25, 56.38 and 57.1 3g respectively, egg weight is known to be regulated by the age of the birds as well as dietary energy levels and since these two factors are the same in the five dietary treatments, the average egg weight was not expected to be significantly different among the five dietary means. The results obtained here reveal that egg weight did not differ significantly among treatments and weekly egg weight showed moderate variations, average egg weight mean values are less than those reported in literatures. However, (18) reported that lysine percentage of diet affects egg weight and the only source of lysine for experimental diet is from soya and roasted soya and this might be responsible for less average egg weight recorded for all treatments.

Conclusion and Recommendation

It can be conducted that:

1. Unpeeled cassava mash at the three levels of inclusion (25%, 50% and 100%) compete effectively well with maize (100%) based diet in supporting egg production and quality.
2. The 50% level of inclusion of unpeeled cassava mash in the layers diet tended to be better than 100% unpeeled cassava mash as energy source when considering egg weight, while 100% maize based diet numerically better than four levels of inclusion of cassava mash when considering egg production.

Therefore, it can be recommended to farmers that inclusion of cassava mash at three levels of inclusion at (25%, 50% and 100%) compete effectively well with maize at (100%) based diet in supporting egg production and quality and can therefore be put into application where it is found to be cheaper than maize.

Table 1: The gross composition of the experiment diets

	Dietary Treatments				
Ingredients (%)	**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

	Dietary Treatments				
Nutrient Composition (%)	**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: Summary of Mean of Performance of Layers Fed Different Dietary Treatments

Parameters	**Dietary Treatments**				
	1	**2**	**3**	**4**	**5**
	(Control) 100% maize	25% Unpeeled Cassava mash	50% Unpeeled Cassava mash	100% Unpeeled Cassava mash	25% Peeled Cassava mash
Feed intake (g/birds/day)	115.90^{a} ±2.53	108.87^{b} ±2.15	108.87^{b} ±1.87	108.70^{b} ±2.29	109.81^{ab} 2
Feed Conversion Ratio (kg/tray)	4.95 ± 0.08	4.80 ± 0.12	4.93 ± 0.10	4.90 ± 0.16	5.03 ± 0.13
Hen Day Production (%)	70.32^{a} ± 1.29	68.63^{ab} ± 1.11	66.45^{ab} ± 0.94	67.39^{ab} ± 1.82	65.87^{b} + 1.2
Egg weight (g)	56.84 ± 1.13	57.04 ± 1.11	57.25 + 1.18	58.38 ± 1.08	57.13 + 1.40
Mortality (%)	10.00 ± 3.00	13.00 ± 0.93	0.00	10.00 ± 3.00	7.00

Note: Mean ± standard error mean

a, b, c, means in the same row with the same superscript are not significantly different (P>0.05)

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