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PERFORMANCE CHARACTERISTICS OF GROWING PULLETS FED CASSAVA ROOT-BASED DIETS

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ABSTRACT

A 13-week study was carried out to investigate the potentials of peeled and unpeeled cassava roots as a substitute for maize in layers ration. Unpeeled cassava root meal was used at 3 levels of inclusion (25%, 50% and 100%) while the peeled cassava meal was used only at 25% level of inclusion in the diet. A total of 140 black harco pullets were randomly allotted to 5 experimental diets in line with cassava root meal inclusion as diet 1 (control diet without cassava root), diet 2 (25% unpeeled cassava root meal), diet 3 (50% unpeeled cassava root meal), diet 4 (100% unpeeled cassava root meal) and diet 5 (25% peeled cassava root meal). The study lasted for 13 weeks. No significant difference ($p<0.05$) were observed in the values obtained across the treatment groups for feed intake. Birds that were fed with 100% unpeeled cassava meal (diet 4) had significantly lowered body weight gain when compared with birds that were fed with diets 1, 2, 3 and 5 which had similar values. No significant difference was observed in the feed conversion ratio of birds fed with diets 1,2,3 and 5 but these values were significantly lower that the value for diet 4. Other performance indices like age at first egg and hen day production at 24 weeks were not affected by cassava root meal inclusion in the diets. The cost of producing feed using cassava root meal was however cheaper than maize based diet.

Keywords: Pullets, Cassava meal, Peeled, Unpeeled, Hen day production

INTRODUCTION

One of the major problems affecting the poultry industries in the tropics is the escalating price of feed ingredients such as maize and soya bean meal (Fafiolu *et al*., 2004). The increased prices of animal feed stem from the fact that some of the raw materials that are used for feed formulation e.g. maize have competitive demand between man and livestock. Apart from the competition between man and livestock for maize, food production is on the decline while population keeps increasing (Oluyemi and Roberts, 1978). In view of this scenario, there is compelling need to find a suitable alternative to the use of maize as conventional energy source for poultry. Cassava root has been evaluated and found suitable for incorporation into poultry diets (Fetuga and Tewe, 1985). One of the major obstacles to the use of cassava as supplement in poultry diet is the presence of cyanogenic glucosides mainly as linamarin and to lesser extent as lotaustralin that are present in the leaf and tuber of the plant. (Agbor-Egbe and Mbome, 2006). The cyanogenic glucosides

can be removed through appropriate processing technique like sundrying and oven drying.

A lot of studies have shown that cassava root inclusion in poultry feed at certain level can be useful. According to Oruwari *et al.* (2003) and Nwokoro and Ekhosuehi (2005), one of the advocated alternative for partial replacement of maize in poultry diets is the processed cassava root meal. The use of cassava root as an alternative unconventional energy feedstuffs could help reduce the feed cost (Salami and Odunsi 2003; Ukachukwu 2005; Anaeto and Adighibe 2011). Cassava has been reported to give satisfactory performance when fed as replacement to maize in poultry diet (Anaeto and Adeghibe, 2011). Not only is the use of cassava desirable in terms of performance but it also cost effective. Information on the use of peeled cassava meal is still scanty. This study was therefore carried out to evaluate the performance of layers fed with peeled and unpeeled cassava root meal as possible replacement for maize at different graded levels

MATERIALS AND METHODS

Source and production of cassava root meal

Cassava tubers (*Manihot utilisima*) used in this study were obtained from cassava breeding unit of International Institute of Tropical Agriculture in Ibadan Nigeria. Unpeeled cassava tubers were processed by slicing the whole root with cassava chipping machine of 2mm sieve while the peeled cassava root was obtained by first peeling the tubers and then slicing to the same 2mm size.. The processed cassava were sundried for 2 weeks on a concrete floor to a moisture level of 12-15%.

Experimental diets

Five experimental diets were compounded for this study. The control diet was a typical layer diet containing 2474 kcal/kg metabolizable energy (ME), 15.41% crude protein (CP) and other nutrients were calculated to meet or slightly exceed the nutrient requirements recommended by the National Research Council (NRC, 1994). The composition of the experimental diets is shown in Table 1. In diet 2, 3, 4 and 5, maize was replaced with processed cassava root meal (peeled and unpeeled).

Experimental Animals and Management.

A total of 140 one-day-old black harco pullets were purchased from a reputable hatchery in Ibadan. The birds were raised on basal diet from day old to 10 weeks before being allotted to five experimental diets and replicated twice with each replicate having 14 birds in a completely randomized design. All experimental protocols and management practices which included draining of remaining water, washing of the watering trough and supply of fresh clean cool water, removal of poultry dropping from the remaining feeds in the feeders and addition of fresh feed on daily basis were observed throughout the study. The five experimental diets include. diet 1 (control diet without cassava), diet 2 (25% unpeeled cassava meal), diet 3 (50% unpeeled cassava meal), diet 4 (100% unpeeled cassava meal) and diet 5 (25% peeled cassava meal). The diets and water were provided *ad libitum* throughout the experiment.

Experimental Schedule and Data Collection

The feeding trial lasted for thirteen weeks while the parameters measured within the period include feed intake, weight gain, feed conversion ratio, mortality, age at first egg,

age at 20% hen day production and hen day production at 24th week. The data obtained in the studied parameters were subjected to analysis of variance (ANOVA) using SAS (1999) and significant level of ($p<0.05$) was used while means were compared using the Duncan multiple range test.

Feed intake

Feed intake was determined as the difference between amount of feed given and leftover.

Feed intake = quantity of feed served - quantity of leftover feed.

Body weight gain

Weight gain was measured as the difference in weight at the beginning of the study and at the end of the experiment.

Body weight gain = final weight of the birds – initial weight

Feed conversion ratio

Feed Conversion ratio was determined by the ratio of feed intake and weight gain.

$$FCR = \frac{\text{feed intake}}{\text{body weight gain}}$$

Mortality

This was measured in percentage and determined as the number of birds that died divided by the number housed multiplied by 100.

$$\text{Mortality} = \frac{\text{number of dead birds X 100}}{\text{Number of birds housed}}$$

Age at first egg

This is the age (in days) at which the bird lay its first egg.

Age at 20% hen day production

This is the age of the birds when their hen day production reached 20%

Hen day production at 24th week

This is the percentage egg production of the birds when they attain the age of 24 weeks.

Cost per kilogram of feed

For each experimental diet, the cost of producing a kilogram was calculated

Table 1: Composition of the experimental diets

		unpeeled CM		peeled CM	
Ingredients	**Control**	**25%**	**50%**	**100%**	**25%**
Maize	24.00	19.00	13.50	-	19.00
Cassava (unpeeled)	-	6.00	13.00	28.00	-
Cassava (peeled) -	-	-	-	6	
Wheat bran	29.00	15.00	15.00	10.50	15.00
Corn bran	29.00	28.00	25.50	23.00	28.00
Palm Kernel Cake	19.50	19.00	18.00	19.00	19.00
Groundnut Cake	4.50	5.50	7.00	10.50	5.50
Soybean meal	2.00	2.50	3.00	4.00	2.50
Fish meal	1.00	1.00	1.00	1.00	1.00
Oyster shell	1.50	1.50	1.50	1.50	1.50
Blood meal	2.00	2.00	2.00	2.00	2.00
*Premix	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Total	**100 .00**	**100.00**	**100.00**	**100.00**	**100.00**
Calculated Nutrients					
Crude Protein(%)	15.41	15.35	15.41	13.67	15.35
ME (kcal/kg)	2474	2489	2484	2495	2480
Crude fibre (%)	6.34	7.12	7.33	7.52	7.13

*Vitamin/mineral premix/kg of feed contains: Vit A, 10,000,000 I.U.; vitamin D3, 2,000,000 I.U.; vitamin E, 16g; vitamin K, 1.0g; vitamin B1, 0.509mg; Riboflavin, 2-4mg; pyridoxine, 0.35mg; niacin, 3.5mg; biotin, 0.005 mg; choline chloride 30.0mg; folic acid 0.1mg; vitamin B12, 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; antioxidant 120,000mg; selenium, 120mg.

RESULT

Performance indices of pullets fed experimental diets are shown in Table 4. There was no significant difference ($p<0.05$) in the mean values of feed intake, mortality, age at first egg, age at 20% hen day production and hen day production at 24 weeks in the current study. However numerical value of feed intake in control diet was the highest (81.72g) while the least feed intake (77.62g) was obtained in diet supplemented with 25% unpeeled cassava meal. The body weight gain for layers fed cassava root meal showed significant difference in their mean values in this study. Body weight gain in control (diet 1), 25% unpeeled CRM (diet 2), 50% unpeeled CRM (diet 3) and 25% peeled CRM (diet 5) were similar but significantly higher than the value obtained in diet 4 with 100% unpeeled CRM (Table 4). Similar trend was observed in the result of feed conversion ratio in the current study where feed conversion ratio in control (diet 1), 25% unpeeled CRM (diet 2), 50% unpeeled CRM (diet 3) and 25% peeled CRM (diet 5) were similar but significantly lower than the value obtained in diet 4 with 100% unpeeled CRM.

The result obtained for cost of producing each diet showed that the cost of producing the control diet (diet 1) is statistically the highest (N174.39) while 100% unpeeled cassava root meal (diet 4) is the lowest (N157.06). The cost of producing 25% and 50% unpeeled cassava root meal were however the same.

Table 2: Proximate Composition of the Experimental Diets

		unpeeled CRM			peeled CRM
Ingredients	Control	25%	50%	100%	25%
Dry Matter	89.25	88.97	89.72	88.78	90.13
Crude Protein	16.63	18.73	19.43	18.38	18.55
Ether Extract	3.19	5.05	4.83	3.36	5.14
Crude Fibre	6.59	5.25	7.22	6.21	7.83
Ash	9.91	10.00	9.92	9.50	11.86
*NFE	52.93	48.94	48.32	51.33	46.75
Calcium	0.67	0.80	0.84	0.66	0.84
Phosphorus	0.47	0.42	0.46	0.47	0.56

*NFE = Nitrogen free extract, *CRM = Cassava root meal

Table 3: Proximate Composition of cassava leaves, peels and tubers

Constituents	Leaves	Peel	Tuber
Dry Matter	19.5 – 33.0	27.3 – 33.5	13.0 – 43.
Crude Protein	14.7 – 36.4	2.8 – 6.5	1.5 – 3.5
Ether Extract	4.0 – 15.2	0.5 – 2.2	0.8 – 3.2
Crude Fibre	4.8 – 15.4	10.0 – 22.0	1.3 – 7.7
Ash	5.5 – 16.1	3.5 – 10.4	1.6 – 4.1
*NFE	37.3 – 51.9	62.5 – 72.9	88.0 – 94.5

***NFE = Nitrogen free extract**
Source: Smith, 1992

Table 4: Performance Characteristics of pullets fed with cassava based diets

		unpeeled *CRM		peeled CRM		
Ingredients	Control	25%	50%	100%	25%	SEM
Feed Intake (g/day)	81.72	77.62	79.71	80.86	79.68	1.56
Weight gain (g/day)	10.66^{ab}	10.78^{ab}	11.50^{a}	9.36^{b}	11.33^{a}	0.48
FCR	7.67^{b}	7.24^{b}	6.94^{b}	8.65^{a}	7.05^{b}	0.26
Mortality (%)	3.60	0.00	0.00	3.60	3.60	2.77
Age at 1st egg (day)	149.5	150.5	150.5	154.5	151.5	1.96
Age at 20% HDP	154.1^{ab}	155^{a}	155^{ab}	157^{a}	155^{ab}	1.30
HDP at 24th week (%)	46.68	46.93	49.59	37.74	58.34	7.96
Cost/kg of feed(N)	174.39^{a}	162.66^{c}	162.91^{c}	157.06^{d}	167. 77^{b}	1.50

***CRM = Cassava root meal**

^{abcd} means on the same row with different superscript are significantly different

DISCUSSION

The value obtained for proximate composition of the unpeeled and peeled cassava meal shows variation in numerical values especially with crude protein and crude fibre (Table 2). Proximate composition of cassava meal revealed that crude protein and crude fibre were higher in unpeeled cassava meal than in the peeled cassava meal. This variation in crude protein could be due to the fact that the cassava peel contains high protein concentration than in the tuber. Smith (1992) also reported higher level of crude protein and crude fibre in the peel of cassava compared to the tuber.

The result on feed intake for layers fed with cassava root-based diets were the same across the group. This result is in agreement with the work of Yin Kyawt *et al.* (2014) who reported that there was no significant difference in feed intake, egg production, egg weight and feed conversion ratio for birds that were fed with diets containing cassava tubers and leaf. Contrary to this finding, Salami and Odunsi (2003) reported a significant higher feed intake in birds that were fed with cassava diets than in the control.

Body weight gain of birds fed 50% unpeeled cassava meal was the best but at 100% cassava substitution with maize, body weight gain was at the lowest level. Similar to our findings, Eruvbetine *et al.* (1996) and Salami and Odunsi (2003) found reported that replacement of maize beyond 50% in the diets of grower cockerel and layers respectively may lead to reduction in body weight. This is however contrary to the findings of Kana *et al.* (2013) which reported that layers could tolerate up to 100% replacement of maize with cassava meal in the diet without any adverse effect on weight gain.

The effect of dietary inclusion of cassava root meal showed that 100% substitution of maize with cassava root meal was not as good as partial replacement. Ijaiya *et al.*(2002) observed that a high dietary crude fibre content of the cassava peel reduced feed conversion efficiency. Salami and Odunsi (2003) reported a significant improvement in FCR in diets containing cassava peel meal.

Dietary supplementation of cassava with maize did not have any effect on the onset of egg production and hen day production at 24 weeks as affirmed by the result of our studies.

The cost of producing the 100% cassava root meal was the cheapest. This indicates that significant savings can be made from feed when cassava root meal is used as energy source rather than maize. This cost effectiveness agrees with the previous works of Salami (2000) and Odunsi *et al.* (2001).

CONCLUSION

It can be concluded from this study that cassava can be substituted for maize as energy source in the diet of layers and yet achieve better result in terms of performance and cost effectiveness. Thus, the use of cassava root meal up to 50% replacement for maize should be encouraged to reduce dependence on maize and cut down on cost.

REFERENCES

Anaeto, M. and L. C. Adighibe, 2011. Cassava root meal as substitute for maize in layers ration. *Brazilian journal of poultry science. 13:153-156*.

Fafiolu, A.O., Oduguwa, O.O., Ikeobi C.O.N., Onwuka C.F.I. and Adebule M.A. 2004. Performance and egg quality assessment of laying hens fed malted sorghum sprouts based diets. Proceedings of the *9th Annual Conference of Animal Science Association of Nigeria* Abakaliki, Nigeria, Ebonyi State University, P 33 – 35.

Fetuga B. L. A. and O. O. Tewe 1985. Potentials of agro industrial by-products and crop residues as animal feed. *Nigeria Food Journal. 2(2) 136-141*.

Ijaiya A.T., Fasanya O.A., and A.B. Ayanwale, 2002. Reproductive performance of breeding does fed maize and fermented cassava peel meal. *Proc. 27th Ann. Conf., Nig. Soc. For Anim. Prod. (NSAP), March 17 – 21, 2002, Fed. Univ. Tech., Akure, Nigeria, pp:249-252*.

Kana, J.R, Kreman, Mube K.H., Teguia, A and Manjeli, Y. 2013. Effect of substituting maize with cassava root meal on laying performances of local barred chicken under improved management conditions in Cameroon. *Journal of Livestock Research for Rural Development 25(10) 2013*

Khajarern S. and Khajarern J. M. 1977. Use of cassava as food supplement for broiler chicks in proc. *Fourth Symp. Inter. Soc. Trop. Roots Crops, cock J. Machtyre R and Graham M. Eds, CIAT Colombia, IDRC-080e1977, 246*

NRC 1994 Nutritional Research Council. Nutritional requirements of poultry. *9th Rev. Edition. National Academic Press Washington DC USA.*

Nwokoro S.O. and Tewe O.O. 1995. Lysine requirement of growing cockerel. *Indian Journal of Poultry Science, 30:41 – 45.*

Oluyemi J. A. and F. A. Roberts, 1979. *Poultry Production in warm wet Climates. Macmillan Publishers London and Basingstoke.*

Oruwari B.M., Anibo, A.O. and Nkanta D.M. 2003. Effect of replacing maize with cassava/brewers dried yeast blend cassava yeast on performance of broiler chicks and feed cost in Southern Nigeria. Nigerian Journal of Animal Production, 30(2):168 – 178.

Salami R. I and Odunsi A. A. 2003. Effect of Processed Cassava Peel Meals As Substitutes For Maize In The Diets Of Layers. *International Journal of Poultry Science*, 2:112 – 116.

Smith O. B. 1988. A review of Ruminant

responses to cassava based diets. Pp 35-53 in *proceedings of the IITA/ILCA/University of Ibadan workshop on the potential utilization of cassava as livestock in Africa* 1992. IITA Ibadan Nov. 14-18, 1988.

Tewe O. O. 1994. Indices of cassava safety for livestock feeding. *Acta Horticultural International workshop on cassava safety*. (M. Bokanga, A.J.A. Essers, N. Poulter, H. Rostling, O. Tewe eds).

Ukachukwu S.N. 2015. Studies on the nutritive value of composite cassava pellets for poultry:chemical composition and metabolizable energy. *Livestock Research for Rural Development. Volume 17, Article 125*. Retrieved March 1 2012 from http://www.Irrd.org/Irrd 17/11/ukac17125.htm.

Tabayonyon T. T. 1935. The value of cassava refuse meal in the rations for growing chicks, Phill pp Agric 24, 509, 1935

Yin Y. K. Hidemi T., Win M. H., Sarayut T., Yoshimi I. and Yasuhiro K. 2014 Effects of cassava substitute for maize based

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