EGG PRODUCTION PERFORMANCE OF ISA BROWN LAYER CHICKENS FED CASSAVA (*Manihot esculenta*) PLANT MEAL-BASED DIETS

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ABSTRACT

One thousand (1,000) nineteen (19) weeks old Isa Brown pullets were randomly assigned to four experimental diets in a completely randomised design study that lasted sixteen (16) weeks. It evaluated the laying performance of the pullets. There were 10 replicates per treatment with each replicate comprising 25 laying pullets. Three cassava plant meal products (CPMs) were developed; **CPM 1: Cassava leaves (27.78%) + Tender stem (5.56%) + unpeeled tuber (66.67%); CPM 2: cassava leaves (23.81%) + Tender stem (4.76%) + unpeeled tuber (71.43%) and CPM 3: Cassava leaves (20.83%) + Tender stem (4.17%) + unpeeled tuber (75%).** The CPMs were then used to constitute three experimental diets. The diets were 100% cassava-based in replacement of maize and a control diet of maize based making four experimental diets. Diets CPM 2 (1.99) or CPM 3 (1.90) supported efficient egg production in terms of FCR/Kg egg mass as maize based diet.

Key words: Alternative energy, cassava plant meal product, FCR, laying chicken, yolk colour

INTRODUCTION

Cassava is the highest supplier of carbohydrates among staple crops and has potential to completely replace maize as an energy source in poultry diets (Morgan and Choct, 2016). It had earlier been reported that whole cassava meal could replace 25% of maize in laying hen diets without negative effect on laying performance (Aderemi *et al*., 2012). The metabolizable energy (ME) of cassava leaves range from 1,590kcal/kg (Khajarern and Khajarern, 2007) to 1,800kcal/kg (Ravindran, 1991). Cassava leaves can be ground into meal to be fed to poultry as a source of protein and carotene (Khajarern and Khajarern, 1992). Cassava based diets need to be supplemented with 0.2% to 0.3% methionine. In agreement with the development of composite cassava plant meal, Olugbemi *et al*. (2010) reported that cassava is low in protein and the protein it has is of poor quality with very low essential amino acid contents. Therefore, cassava based diets can have enhanced nutritional quality through the incorporation of cassava leaves which are richer in protein (Ngiki *et al*., 2014). Consequently, this study tends to evaluate the egg laying performance of Isa Brown chickens fed cassava plant meal-based diets.

MATERIALS AND METHODS

Description of Study Area

The study was carried out at the Poultry Unit of the Teaching and Research Farm, Olusegun Agagu University of Science and Technology (OAUSTECH) Okitipupa, Nigeria. The OAUSTECH is located within the rainforest zone, Latitude 5^{o} 28’ N and longitude 4^{o} 46’ E at an elevation of about 200 m above sea level.

Collection and Preparation of Test Ingredients

Cassava variety (TMS 30572) aged 2 years was purchased in a commercial farm around Okitipupa. The leaves were harvested from the stem while the tender cassava stem was harvested at 5 cm, usually 6 to 7 nodes from the top of the plant. They were processed and stored according to the method described by Asaniyan and Adeyemi (2022).

Product Development

Three cassava plant meal products (CPMs) were developed, namely; CPM 1, CPM 2 and CPM 3. The CPM products were mixed at different ratios to achieve a minimum crude protein level of 10 % as maize

(Asaniyan and Adeyemi, 2022). The mixing of the CPMs followed the procedure earlier described by Akinfala *et al.* (2002). The CPMs were then used to replace maize in the experimental diets (Table 1). The proximate compositions of the experimental diets are presented in Table 2.

Table 1: Ingredients composition of experimental diets fed experimental birds from 8 to 35 weeks of age

	DIETS			
Ingredients (%)	**Control**	**CPM 1**	**CPM 2**	**CPM 3**
Maize	50	-	-	-
CPM	-	50	50	50
Groundnut cake	6	6	6	6
Soybean meal	11	11	11	11
Wheat offal	10	10	10	10
Palm kernel cake	12.80	12.80	12.80	12.80
Fish meal	1.00	1.00	1.00	1.00
Bone meal	5.50	5.50	5.50	5.50
Oyster shell	3.0	3.0	3.0	3.0
Premix*	0.25	0.25	0.25	0.25
Methionine	0.10	0.10	0.10	0.10
Lysine	0.10	0.10	0.10	0.10
Salt	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00

CPM 1: Cassava leaves + Tender stem + unpeeled tuber at ratio 2:1: 5; CPM 2: cassava leaves + Tender stem + unpeeled tuber at ratio 2.5:1: 5; CPM 3: Cassava leaves + Tender stem + unpeeled tuber at ratio 3:1: 5

*Contains per kg of powder: *Calcium: 27.3%; Crude fibre: 0.02%; Vitamin A:4000000 IU.; Vitamin D3: 1000000 IU; Vitamin B1: 6000 IU.; Vitamin B2: 600mg.; Vitamin B6:1600 mg.; Vitamin B12: 1200 mg.; Vitamin K3: 6000 µg.; Pantothenic acid:800 mg.; Folic acid:40000 mg.; Biotin: 800 mg.; Niacinamide:3200 mg.; Choline chloride: 200 µg.; Iron: 80000; Iodine: 16000 mg.; Copper 600 mg.; Manganese: 400 mg.; Zinc: 32000 mg.; Selenium: 20000 mg*.

Pullets and Experimental Treatments

One thousand (1,000) nineteen (19) weeks old ISA Brown pullets were purchased from a reputable farm in Ibadan, Oyo State. The experimental pullets were randomly assigned to three experimental and control diets in a completely randomised design. There were 10 replicates per treatment with each replicate comprising 25 pullets. Four experimental diets of three cassava-based diets and the control diet of maize-based fed to chickens were formulated as presented in Table 1. The control diet was maize-based and contain 50 % maize. Diets CPM1, CPM2 and CPM3 were 100 % cassava-based in replacement of maize and contained CPM 1, 2 and 3.

Table 2: Proximate composition of experimental diets

	DIETS					
Parameters (%)	**Maize**	**CPM 1**	**CPM 2**	**CPM 3**	**SEM**	**P**
Dry Matter	90.28	92.31	90.28	90.85	3.98	0.10
Crude Protein	17.02	17.88	17.26	17.54	0.49	0.44
Crude Fibre	5.53	5.89	5.94	5.98	0.58	0.32
Ether Extract	1.29	1.02	0.87	0.76	0.49	0.43
Ash	4.90	5.57	5.70	5.84	0.65	0.09
Nitrogen Free Extract	70.26	68.79	68.43	68.20	2.25	0.54

CPM 1: Cassava leaves + Tender stem + unpeeled tuber at ratio 2:1: 5; CPM 2: cassava leaves + Tender stem + unpeeled tuber at ratio 2.5:1: 5; CPM 3: Cassava leaves + Tender stem + unpeeled tuber at ratio 3:1: 5

Chemical Analysis

The proximate analysis of the experimental diets was carried out as outlined by AOAC (2010).

Layers performance

The birds feed intake was determined weekly through which the daily feed intake was computed. Daily number and weight of eggs laid were recorded. The egg production was determined to be the average hen-day production value.

Statistical Analysis

All experimental data were analysed using One-way Analysis of Variance while means were separated by Duncan Multiple Range Test at 95 % level of significance (SAS Inst. Inc., Cary, NC).

RESULTS AND DISCUSSION

The proximate composition parameters of the diets were not significantly (P>0.05) different. The non-significant of proximate composition parameters of the experimental diets among the ingredients revealed that the cassava plant based ingredients virtually had similar levels of proximate parameters. The ether extract values decreased with the increased percentage inclusion of unpeeled cassava tubers to the CPM mixtures in the diets. This tends to show that cassava plant meal can sustain the caloric level of a diet without necessarily escalate the lipid/fat content. This corroborates low fat concentration of cassava root meal as reported by Akapo *et al*. (2014).

Table 3 showed significant (P<0.05) differences for only age at 1st egg (days) and FCR/Kg egg mass among the treatment diets. The cassava plant based diet CPM1 had the highest age (176 days) of the pullet at when the first egg was laid, significantly (P<0.05) different from CPM3 (159 days) and maize based diet (156 days) that were not significantly (P>0.05) different from one another but both significantly (P<0.05) different from CPM2 (165 days). The similar age at first laid egg by the layers for CPM3 and maize based diet for the egg production (19-35 weeks) performance of ISA Brown layer breed showed equal nutritional potential of cassava plant meal with maize in layer diet. Also, the similar FCR/Kg egg mass values of the layers under maize and CPM3 is an evidence of equal feed efficiency per kg egg mass. Coincidentally, their FCR/Kg egg mass values were below 2.2 value; hence, maize, CPM 2 and CPM 3 had equal beneficial contribution to optimum egg production. Consequently, either CPM 2 or CPM 3 can replace maize in the diet of laying chickens without compromising efficient egg production (Aderemi *et al*., 2012).

Table 3: Egg production (19 – 35 weeks) performance of Isa brown birds fed cassava plant meal diets

	DIETS					
Parameters	**Maize**	**CPM 1**	**CPM 2**	**CPM 3**	**SEM**	**P**
Age at 1st egg (days)	156^{c}	176^{a}	165^{ab}	159^{c}	3.21	0.010
Average feed intake (g/bird/day)	108.00	120.01	115.00	112.00	2.51	0.47
Egg weight (g)	59.26	54.75	57.70	59.00	1.93	0.90
Egg mass index	50.88	46.72	49.84	52.65	2.06	0.86
Hen day production (%)	85.86	85.34	86.38	89.24	2.24	0.96
FCR/Kg egg mass	1.82^{b}	2.19^{a}	1.99^{ab}	1.90^{ab}	0.06	0.014
FCR/dozen egg	1.30	1.50	1.45	1.40	0.04	0.46

CONCLUSION AND RECOMMENDATION

The CPM 3 like maize based diet promoted early commencement of laying among the CPMs diets. However, either CPM 2 or CPM 3 equally supported efficient egg production in terms of FCR/Kg egg mass as maize based diet. The other egg production parameters that were not significant tends to justify the potential of any of the cassava plant meal diets to replace maize in layer diet without compromising the laying capacity of the Isa Brown breed layer. It is recommended to adopt either CPM 2 or CPM 3 in feeding laying chickens for efficient egg production.

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