Egg laying response of Arco black hen to garri chaff and cassava peel based diets

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Abstract

The need to optimize the utilization of garri processing by-products and improve the protein availability through egg production motivated this study. 165 Acro Black laying hen of 41 weeks old were grouped into five dietary treatments of 35 birds per treatment and five replicates of seven birds each. Layers' diets were compounded at 0%, 11.25%, 22.5%, 33.5% and 45% of garri chaff and 0%, 3.575%, 7.15%, 10.275% and 14.3% of sun dried cassava peel levels of inclusion. The diets and groups of birds were labelled A, B, C, D and E and the birds were fed with their corresponding diets for 6 consecutive weeks. Records of feed consumption and number of eggs laid were taken daily throughout the period of experimentation. The results showed that egg laying performance was of the order C>D>A>B>E among the dietary treatments. While egg laying performance hovered around 60% in the control treatment A, it increased from 57% to 86% in group C. Birds in treatment E had the least feed consumption and least egg laying performance. Weight increase of the birds at the end of the experimentation were of the order A>B>D>C>E. It was thus concluded that garri chaff and cassava peel appeared useful as ingredients in layers' diets at about equal quantity with maize and wheat offal, respectively but the feed should be adequately fortified with protein rich feedstuffs and the diets must be introduced early to avoid rejection by the birds.

Keywords: Garri chaff, cassava peel, layers mash, egg laying, performance

Introduction

Cassava is the chief source of food energy for the majority of the people living in the lowland tropics and much of the sub-humid tropics of West and Central Africa. (Tsegia and Kormawa, 2002). Nigeria has been leading in the production of cassava since 1991 and production had risen to over 45million metric tonnes in 2009 (FAO, 2009). Garri is the most consumed and traded food derivative of cassava tubers (Echebiri and Edaba, 2008). It is a creamy-white, partially cooked, free flowing granular flour with slightly fermented and sour taste (PIND, 2011). Over 70% of the cassava produced in Nigeria is processed into garri.

The processing of garri consists of peeling the tubers, washing, grating, fermenting, pressing, sifting, toasting and sifting again.

Garri and dried peel yields of cassava are 25-30% and 10-20% respectively, the rest being water and fibrous materials (Ayanwale, 1990, Gbadegesin, 2004). High waste contents associated with garri production probably is an important reason for the relatively low price usually paid by garri processors to cassava farmers.

Garri is essentially a carbohydrate food with very low protein content (2-3%). Consumption of garri foods requires supplementation with high quality animal protein in the form of eggs and meat. Various researchers including Longe (1990), Esonu and Udedibie (1993), Osei and Duodu (1998) and Osei and Twumasi (1999) have used various forms of cassava to formulate feed for broilers, growers, rabbits and ruminants. The consensus among these researchers was that cassava

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chip and peel can be used as partial replacement at varying levels of inclusion in animal feed. The use of garri chaff has however received very little attention by researchers as animal feedstuff probably due to the competition for it by man. Garri chaff comprises the larger particles and fibre sifted from the roasted cassava cake. It is definitely lower in food quality than garri and could better serve as a replacement for the conventional energy sources in animal feed. The objectives of this study therefore were:

- i. To formulate, produce and test layers mash containing garri chaff and sun dried cassava peel as replacement for maize and wheat offals respectively
- ii. To determine the egg laying performance of Arco Blackstrain of layers fed diets containing garri chaff and sun dried cassava peel as replacement for maize and wheat offal, respectively.
- iii. To determine the effect of garri chaff and cassava peel on egg-feed conversion ratio of layer birds.

The fact that garri yield from cassava tuber is very low (20%-35%) (Achinewhu *et al.*, 1998; Karim *et al.*, 2009) calls for more beneficial uses of the peel and chaff. This would improve the returns from garri processing as these bye-products would generate additional revenue. There is also the urgent need to improve the production of high quality animal protein using alternative local feedstuffs such as garri chaff and cassava peel. This is particularly necessary now that erratic rainfall occasioned by climate change is causing decreasing yields of maize in most parts of the country (Tunde *et al.*, 2011; Chikezie *et al.*, 2015). Substantial quantities of feedstuffs are being imported especially, maize, wheat offals, fish meal, vitamins and

minerals. Garri chaff and sun dried cassava peel which are substitutes for maize and wheat offals respectively can be used in livestock feed to conserve foreign exchange more so now that the major foreign exchange earner (i.e. crude oil) for the country appears to be performing poorly in the world market with crude oil prices dropping from USD114 to USD28 between 2014 and 2016 (MBNP, 2017). This is expected to further boost cassava production and processing. The multiplier effects of improved cassava production would affect the economy positively and the generality of Nigerians would be better for it.

Materials and methods

The study was conducted in the Poultry Unit of Agricultural Education Department, Federal College of Education, Abeokuta. The experimental birds were 41 weeks old Arco Black strain of layers at the beginning of the experiment having been sourced at day old from Ajanla Farm, Ibadan. 175 Arco Black layers were used; the birds were divided into five groups of 35 birds. Each treatment was replicated five times with 7 birds per replicate.

Five experimental layer diets (A, B, C, D, E) were formulated such that garri chaff made up 0.00, 11.25, 22.50, 33.75 and 45.00% while cassava peel made up 0.000, 3.575, 7.150, 10.725 and 14.300% of the diets, respectively replacing maize and wheat offal (Table 1).

The five experimental groups were thereafter, randomly assigned to the five experimental diets in a completely randomized block design for the feeding trial that lasted 6 weeks. Feed offered were weighed and the left over the following morning were collected and weighed every day before fresh feeds were administered to determine feed intake. Eggs were collected

Table 1: Composition of Experimental Diets

Ingredients	Composition				
	A	B	C	D	E
Maize	45	33.75	22.50	11.25	0.00
Soya meal	13.00	13.00	13.00	13.00	13.00
GNC	9.50	9.50	9.50	9.50	9.50
Fish meal	1.50	1.50	1.50	1.50	1.50
Wheat offals	14.30	10.275	7.15	3.575	0.00
PKM	6.00	6.00	6.00	6.00	6.00
Oyster shells	8.00	8.00	8.00	8.00	8.00
Bone meal	2.00	2.00	2.00	2.00	2.00
Salt	0.30	0.30	0.30	0.30	0.30
Methionine	0.10	0.10	0.10	0.10	0.10
Lysine	0.05	0.05	0.05	0.05	0.05
Layers premix	0.25	0.25	0.25	0.25	0.25
Gari chaff	0.00	11.25	22.50	33.75	45.00
Cassava peel	0.00	3.575	7.15	10.725	14.30
Total	100.00	100.00	100.00	100.00	100.00
Calculated composition					
Crude protein %	18.826	17.808	16.849	15.771	14.753
ME: Kcal/kg	2587.91	2537.83	2517.76	2497.68	2477.61
Calcium %	3.7079	3.6929	3.7178	3.74275	3.7677
Crude fibre %	4.1705	4.3543	4.5517	4.7490	4.9464

Table 2: Quantities of eggs laid by experimental birds

Week	Number of eggs laid					SEM
	A	B	C	D	E	
1	135	95	120	145	115	12.2
2	105	135	125	150	120	14.3
3	110	135	140	215	110	21.1
4	115	165	160	160	110	10.6
5	95	160	155	155	100	7.3
6	120	165	180	140	130	9.6
TOTAL	680	905	880	965	685	128.4

All data are means of five replicates

Fig 1: Percentage Egg Lay of Birds Across Six Weeks.

Egg laying response of Arco black hen to garri chaff and cassava peel based diets

once daily at 4 o'clock in the afternoon. Records of number and weight of the eggs collected were taken daily. Records of eggs collected in each treatment were used to determine the weekly egg lay during the experiment while the feed consumption record was used in conjunction with egg laying record to determine the feed conversion ratio. Egg records were also used to compute the percentage lay of each group. Initial and final weights of the birds were also used to determine the percentage weight changes of the layers at the end of the study.

Results and discussion

Total eggs laid by the birds (Table 2 and Figure 1) were in the order C>D>A>B>E. It was observed that percentage lay increased from 57% to 86% in Treatment C but the percentage lay in Treatment E was lowest and could have resulted from the quality of feed (Table 1) which had the lowest energy and crude protein levels among the experimental diets.

The performance in Treatment A which

consisted of the conventional feed ingredients was highest at the beginning and hovered around 60% throughout the duration of the experiment. The change in diets appeared to have affected the performance observed in diets B, C, D and E though the performance improved in diets B, C and D which were of composite diets of the conventional feedstuffs of maize and wheat offals and garri chaff and cassava peel. It is noteworthy that equal quantities of maize/wheat offals and garri chaff and cassava peel in Treatment C gave the highest egg laying performance thus confirming the observations of previous researchers (Esonu and Udedibie, 1993); Osei and Twumasi, 1999) that partial inclusion of cassava materials was feasible in poultry diets. Further analysis of the egg laying performance (Table 2) showed the weekly per capita egg laid by the experimental birds.

Average feed consumption by the experimental birds (Table 3) showed that feed consumption was least in treatment E which was wholly garri by-products based diets.

Table 3: Average feed consumption per experimental bird

Week	Feed consumption (kg)					SEM
	A	B	C	D	E	
1	1.5	1.0	1.1	1.2	1.0	0.11
2	1.1	1.0	1.0	1.0	0.7	0.09
3	1.0	1.0	1.0	1.0	0.8	0.03
4	1.2	1.0	0.8	1.0	1.0	0.21
5	1.2	1.0	1.1	1.0	1.0	0.12
6	1.2	1.0	1.1	1.0	1.0	0.03
Total	7.2	6.0	6.1	6.2	5.5	0.51

All data are means of five replicates

It suggested that the palatability of the feed was below that of the conventional diets, which could have been responsible for the poor egg laying performance. It is important therefore to expose layers to garri by products diets as early as possible to

forestall the possibility of rejection due to change in palatability. Egg-feed conversion ratio (Table 4 and Figure 2) thus did not indicate any statistically significant variation among the experimental treatments $P > 0.05$.

Table 4: Average feed conversion ratio

Week	Eggs-feed conversion (eggs/kg)					SEM
	A	B	C	D	E	
1	3.6	2.7	3.6	3.4	3.3	1.1
2	3.8	3.9	4.2	4.3	4.9	1.6
3	4.4	5.3	4.7	6.1	3.9	1.8
4	3.8	4.7	6.6	4.6	3.1	2.0
5	3.2	4.6	4.7	4.4	2.9	2.3
6	4.0	4.7	5.5	4.0	3.7	2.8
Total	22.8	25.9	29.3	26.8	21.8	4.9

All data are means of five replicates

Fig 2: Mean number of eggs laid per bird across six weeks

Initial and final weight of the birds (Table 5) showed increase in weight during the experimentation though whole gari bye products diets increased marginally by 0.9% compared to 11.6% in the control diet

due low feed consumption and relatively low crude protein level in the diet. It is thus important that gari bye product diets be adequately fortified with protein rich feedstuff.

Table 5: Average initial and final weights of the experimental birds

Stage	Average weight (kg)				
	A	B	C	D	E
Initial	1.46	1.11	1.08	1.10	1.14
Final	1.63	1.20	1.10	1.16	1.15
% increase	11.6	8.2	1.9	5.5	0.9

All data are means of five replicates

Conclusion

Garri chaff and cassava peel based diets were compounded and fed to layers for 6 weeks consecutively. It thus appeared that replacement of maize and wheat offals with

garri chaff and sun dried cassava peel at levels of 22.5% and 7.15% respectively gave the best result of egg laying performance. The diets should be introduced to the birds early enough to

avoid rejection and that the diets should be adequately fortified with protein rich feedstuffs to avoid poor feed consumption and performance.

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