International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2013): 6.14 | Impact Factor (2013): 4.438

Effect of Processed Cassava Tuber Meal (Garri) on the Performance and Serum Metabolites of Broilers

Ogbamgba KO[1], George OS[2]

[1]Department of Animal Science, Rivers State University of Science and Technology, Nkpolu-Oroworukwo, Port Haracourt, Nigeria

[2]Department of Animal Science, Faculty of Agriculture, University of Port Harcourt, P.M.B. 5323, Port Harcourt, Rivers State, Nigeria

Abstract: ***An investigation was carried out to evaluate the effect of processed cassava tuber meal (garri) on the growth performance and serum chemistry of broiler chickens. One hundred and twenty (120) day-old Marshal Broiler® chicks were used in a completely Randomized Design (CRD) in an experiment that lasted for seven weeks (49 days). The chicks were randomly assigned to four (4) treatments consisting of 30 birds per treatment with ten (10) birds per replicate; that is, 0% (control), 15%, 20% and 25% garri replacement per 25kg feed. At the end of the trial two (2) birds were picked randomly from each treatment and blood samples collected for haematalogical and serum analysis and analysis of variance (ANOVA). The result obtained showed there was no significant (P>0.05) difference in the treated groups when compared to the control group. However there was numerical increase in weight gain in the group that received feed with 25% garri replacement. It was therefore concluded that processed cassava meal (garri) had beneficial effects in the production of broilers even though it is known to be an atherogenic feed substance.***

Key words: garri, replacement, haematology, serum chemistry, atherogenic feed

1. Introduction

A major factor militating against the rapid expansion of intensive poultry production in developing countries is high cost of feeds and feedstuffs (Omeje *et al*., 1999; Ijaiya, *et al*., 2004). In that regard Onyimonyi and Onukwufor (2003), had observed that this rising cost and scarcity of energy and protein feedstuffs could only be solved by seeking for new alternatives and non-conventional energy and protein sources without adverse effect on performance. Researchers had used non-conventional products that are capable of improving nutrients in a ration for economic benefits to farmers.

Traditionally, processed cassava tuber meal has been fed alone before the introduction of scientifically formulated feed to increase energy level of local birds. Cassava roots, a staple food in many parts of the tropics had been the source of the most daily carbohydrate intake for large population of man and livestock. These carbohydrates are mostly found in storage organs which are enlarged roots (Okereke *et al*., 2013). Due to high cost of conventional energy sources in poultry production, th e utilization of tuber meal such as cassava root meal becomes very important to reduce the overall cost of production. In view of the high cost of energy-containing feedstuff like *zeamays*, there is a task to look for the sources of energy that will reduce the cost of production, yet providing adequate energy required for maximum production. For this reason, *Manihot utilisima* (processed cassava tuber meal or garri) has been suggested as a high energy feedstuff if incorporated in feed or in poultry ration.

Processed cassava tuber meal also known as garri is a creamy-white, granular flour with a slightly fermented flavor and slightly sour taste made from fermented, gelatinized fresh cassava tubers. It is widely known in Nigeria and other West African Countries as a third major source of energy to both man and animals. It has many functions and advantages and it is readily available and very useful to man as well as animals but always has the problem of anti-nutritional factors which pose a health risk when consumed in excess. One of such risks is seen in the case of atherosclerosis which is a disease of the arteries characterized by excess deposition of plaques of fatty material such as cholesterol on the inner walls of the artery. Atherosclerosis is also known as arteriosclerotic vascular disease (ASVD). It is a syndrome affecting arterial blood vessels, a chronic inflammatory response in the walls (intima) of arteries (Ogbamgba et al, 2010). This response occurs in large part due to the accumulation of macrophages or macrophage white blood cells and promoted by low density lipoprotein (LDL) which are plasma proteins that carry cholesterol and triglycerides without adequate removal of fats by functional high density lipoproteins (HDL).

This study seeks to evaluate the effect of feeding graded levels of processed cassava tuber meal (garri) as partial replacement of maize in the growth performance and serum metabolites of broiler chickens and thus improving agricultural practice with the aid of utilizing the potentials of non-conventional feedstuffs like cassava (garri) and its products extensively as another source of energy that is less expensive and yet efficient in improving the nutritional characteristics of feed since the cost of maize is rising astronomically. Hence, the study is aimed at evaluating the effect of Processed Cassava Tuber Meal (Garri) on the Performance and Serum Metabolites of Broilers.

2. Material and Methods

One Hundred and Twenty (120) day-old Marshal Broiler® chicks of mixed sexes were allocated randomly in the pens after brooding. Routine vaccination and medication were strictly adhered to in the cause of the experiment. Good

hygiene was maintained, while feed and water were provided *ad libitum* for the duration of the experiment.

The experimental design used was the Complete Randomized Design (CRD) and the experiment lasted for seven (7) weeks, that is, 49 days after a stabilization (adjustment) period of two (2) weeks. There were four (4) treatments, each replicated thrice such that each treatment comprised 30 birds. Processed cassava tubers (garri) was mixed with the feed in the required proportions. T_1, = control, normal commercial feed with corn (maize) as the major energy source. T_2 = processed cassava tuber meal (garri), added in a 25% combination with the commercial feed, that is 6.25kg garri to 18.75% commercial feed to add up, to 25kg bag commercial feed which can be referred to as "T_2 combination feed". T_3 = Processed cassava tuber meal (garri) at 20% combination, that is, 5kg garri to 20kg commercial fed to add up to 25kg bag commercial feed (that is, T_3 combination feed). T_4 = Processed cassava tuber meal (garri) at 15% combination, that is, 3.75kg garri in 21.25kg commercial broiler feed (T_4 combination feed). The broiler starter/broiler finisher feed used was Amo Byng$^{(R)}$. At the end of the 49 days the birds were weighed and then two (2) birds per treatment collected and severed for haematalogical and serological analyses, using 5ml quantity into an anticoagulant test tube containing Ethylene Diamine Tetra Acetate (EDTA) for haematological determination, and 5ml quantity into a test tube without anticoagulant for serology.

The parameters measured were body weight gain, feed intake, feed conversion ratio and organ weight; also the serum parameters investigated were Cholesterol, HDL, LDL and Triglyceride (TG). The performance parameters measured were subjected to analysis of Varian (ANOVA) according to Steel and Torrie (1980) and where difference existed, the means were separated using Duncan's Multiple Range Test (DMRT), Obi (1990).

3. Results and Discussion

Table 2 shows the performance characteristics of broiler chickens fed processed cassava tuber meals (garri). Significant differences ($P < 0.05$) existed in the mean final weight, daily weight gain, daily feed intake and feed conversion ratio. However, there were no significant differences $P > 0.05$) in mean daily weight gain and feed intake.

Feed Intake

The feed intake of the birds decreased in the treatments when compared to the control (T_1). The decrease became significantly different ($P>0.05$) at 15% combination (T_4) 20% (T_3) and 25% (T_2) combination treatment level. This finding is at variance with the usual concept that feed consumption increases with decrease in protein quality of the feed, that is, the birds have to eat more inorder to balance their protein requirement when the feed quality is low in protein.

Body Weight Gain:

The mean weight gains of the broiler chickens were 2.95kg, 3.10kg, 2.53kg and 2.80kg for control (%), 25%, 20%, and 15% combinations. respectively. The highest weight gain was recorded for broilers fed 25% processed cassava tuber meal (garri) combination through it did not differ significantly ($P>0.05$) from other groups.

Feed Conversion Ratio

This means total quantity of feed consumed divided by weight gain. Feed conversion rations were 2.20, 1.76, 2.22 and 2.30 for control (%), 25%, 20%and 15%, respectively. Feed conversion ratio was better at 25% combination level. This may be due to the fact that the birds consumed less quantity of the commercial feed but more of the "combination feed" to produce 3.10kg meat.

Table 3 shows the effect of processed cassava tuber meal (garri) on the serum biochemistry of the broiler birds. The data obtained show that the low density lipoprotein (LDL) is higher than the high density lipoprotein (LDL) in all the treatments, signifying that the processed cassava tuber meal (garri) is atherogenic (Nissen et al, 2006, Ogbamgba, 2010).

The effect of feeding processed cassava tuber meal (garri) on various haematological parameters are presented on table 3. The blood haematology indices were not significantly ($P>0.05$) affected by the combination levels of the treatments.

With respect to organ weight in table 2, significant difference ($P<0.05$) existed only in the gizzard. The liver was larger in the control compared to the other treatment groups while the gizzard was numerically large in T_2 (25% combination) when compared to the control and other treatment groups.

The feed conversion ratio of the broilers, when fed dietary treatment, increased with decrease in Processed Cassava Tuber Meal (Garri) in he diets in T_3 and T_4 but declined in T_2 which means that the birds converted the feed to weight better in T_2 than in the other treatment groups. This observation is at variance with the reports of Aderemi (2011), Onyinonyi and Okereke (2014) who reported increased feed nutrient requirements when cassava root seviate and cassava peels were fed to layers and pigs. The best feed conversion ratio in this study is T_2 (25% combination) that is, 6.25kg of garri to 18.75kg of commercial feed, to make 25kg "commercial feed", which may be due to the fact that the birds utilized the caloric content in cassava meal (garri), yielding higher lipogenesis and eventual conversion to weight gain. The data obtained for the blood serum showed no significant difference ($P>0.05$)in Cholesterol, LDL, HDL and TG, respectively. Since the LDL is higher than the HDL, it shows that the processed cassava tuber meal (garri) is atherogenic. This finding corroborates that of Ogbamgba (2010) who, working with cassava tuber meal (garri) edto *Chinchilla* rabbits reported that garri is atheroenic.

The haematological results of this research tend to indicate that the increase of treatments in the experimental diets leads to a decline in the haematological parameters which in turn increases the risk of birds to infection when fed an atherogen like processed cassava tuber meal (garri). Also the presence of garri was being regarded as foreign by the body and as a result the body sent *eosinophils* and lymphocytes to fight the foreign body. This finding is also in consonance with that reported by Ogbamgba and Wekhe (2006) who, working on laying hens demonstrated eosinophilia and lymphocytosis in the birds feddiet with the inclusion of pulverized Mansonia *altissima* bark. The presence of monocytes shows that the effect is chronic.

The need to utilize the potentials of non-conventional feedstuff in feed formulation has been high-lighted in this study. The requirement for energy cannot be compared with that of protein (amino acids), minerals and vitamins as that for energy is the highest. This is so because good growth and performance can be achieved with a wide range of energy levels. That is the main reason non-conventional feedstuffs are incorporated to enable the farmers meet the growing human demands for animal protein at reduced costs. This study also corroborates the report of Wekhe et al (2007), that pulverized leaves of the mangrove tree, *Rhizophora racemosa* can lead to weight gain in broiler birds.

4. Conclusion

It is therefore recommended that not more than 25% combination of processed cassava tuber meal (garri) should be incorporated in broiler diet for better performance and reduced cost of production to the end-user.

Acknowledgement

We are grateful to Blessing Eke, Mr. Balefamo Williams of Department of Animal Science, RSUST, Port Harcourt, and Kentish Laboratories Port Harcourt, for their roles in the production of this work.

References

[1] Aderemi FA, Faniyi TO and Jimoh OA (2013). Haematology and Serum biochemistry of broiler chickens fed cassava leaf meal based diet. Pros. 38th Conf. Nig. Soc. Anim. Prod., Rivers State Univ. of Sci. and Tech. Port Harcourt.

[2] Ijaiya AT, Fasanya OOA and Ayanwale BA (2004). Reproductive performance of breeding rabbit does fed maize and fermented Cassava peel meal. Proceedings of 29th Annual Conf. Nig. Soc. of Anim. Prod (NSAP)

[3] Nissen SE, Nicholls SJ and Sipali I (2006). Effect of very high-intensity satin therapy on regression of coronary atherosclerosis: the ASTHEROID trial (PDF) ***JAMA 295 (13): 1556-65.***

[4] Obi IU (1990), Statistical methods of detecting difference between means. 2nd ed, Snapp Press, Enugu, Nigeria.

[5] Ogbamgha KO and George OS (2012). Atherogenic effect of Cowpea, Melon, Soyabean and Cassava in rabbit and regression by garlic. ***New Cleus in Sci 2 (2012): 90-96***.

[6] Okereke COE, Oti E and Okereke IH (2013). Effect of replacement level of maize with cassava root meal supplemented with palm oil in broiler ration. Proceedings of 38th Annual Conf. Nig. Soci. For Anim Production (NSAP).

[7] Omeje ST, Marere FUC and Isiku (1999). Comparative effect of usual commercial feeds and cassava based formulation on the performance of Harco and Yaafa Cockerels. Proceedings of the 26th Conf. of Nig. Soc. Anim Production (NSAP).

[8] Onyimony AE and Onukwufor JO (2003). Effect of toasted Bambara waste on performance of growing pullets. Proceeding of the 28th Annual Conf. Nig. Soci. Anim Prod (NSAP), pp 237-239.

[9] Ogbamgba KO and Wekhe SN (2006). The effect of dietary inclusion of *Mansoni altissima* on feed intake, feed efficiency and feed conversion of laying birds and cocks. **Afr. J. of biotech vol 5 (10). Pp 1022-1024.**

[10] Wekhe SN, Ogbamgba KO and George OS (2009). Additive effects of Rhizophora racemosa (red mangrove) on the blood and the bursa of fabricus of broilers ***Anim. Prod. Research Advances 5(3): 194-197.***

Table 1: Proximate Composition of Experimental Diet

Nutrient	*Cassava meal (garri)*	*Broiler Starter*	*Broiler Finisher*
Moisture (%)	**11.80**	**11.90**	**12.60**
Ash (%)	**0.97**	**6.35**	**8.44**
Protein (%)	**0.48**	**7.2**	**10.40**
Fat (%)	**1.13**	**2.70**	**3.23**
Crude Fiber (%)	**1.59**	**0.72**	**3.49**
Carbohydrate (%)	**81.03**	**71.13**	**61.84**

Table 2: Table showing performance characteristics and organ weigh of broiler chickens fed processed cassava tuber meal (garri)

Parameters	*T_1 (%)*	*T_2 (25%) comb)*	*T_3 (20% comb)*	*T_4 (15% comb)*	*SEM*
Mean initial weight (g)	50.00	50.00	50.00	50.00	0.30
Mean final weight (kg)	3.00^b	3.15^a	2.58^d	2.85^c	0.1
Mean weight gain (kg)	2.95	3.10	2.53	2.50	3.50
Mean daily weight Gain (g)	60.00^a	63.00	52.00^b	57.00^a	3.65
Mean total feed intake (kg)	6.51	5.46	5.64	6.44	1.98
Mean daily feed intake (g)	132.00^a	111.00^b	115.00^b	131.00^a	5.67
Feed conversion ratio (kg feed/kg gain)	2.20^a	1.76^b	2.22^a	2.30^a	0.51
Feed cost/kg weight gain (₦)	215.6^a	172.43^b	217.56^a	225.40^a	43.00
Mortality (%)	0.00	0.01	0.00	0.00	0.00
Organ weigh (g)					
Liver	59.50^a	$49.60a^b$	43.50^b	47.00^b	2.72
Gizzard	41.50	45.00	40.50	38.50	4.02
Heart	15.00	13.50	12.50	12.50	1.78
Kidney	2.50	1.00	1.00	1.50	0.79
Gall bladder	1.50	1.50	1.50	1.50	0.50
Pancreas	5.00	5.50	5.00	1.50	0.5

a, b, c: means within rows with different superscripts are significantly different (P<0.05).

Table 3: Serum biochemistry and Haematological response of broilers feed different levels of processed cassava tuber meal (garri)

Parameters	*T_1 Control 0%)*	*T_2 (25%) comb)*	*T_3 (20% comb)*	*T_4 (15% comb)*	*SEM*
Cholesterol (mg/dl)	3.90	3.60	3.60	3.50	0.15
LDL (mg/dl)	3.10	2.90	2.90	2.90	1.70
HDL (mg/dl)	1.60	1.50	1.40	1.40	0.14
TG (mg/dl)	3.40	3.30	3.20	3.20	0.10
Haemoglobin (g/dl)	7.60	7.50	7.60	7.40	1.04
Packed Cell Vol. (g/dl)	43.00	42.00	43.00	42.00	1.49
RBC ($x10^3$/m/)	3.80	3.80	3.90	3.70	0.24
WBC ($x10^3$/ml)	22.909	23.20	23.20	21.10	1.54
Differential count (%)					
Lymphocytes	70.00	72.00	71.00	72.00	0.65
Basophils	4.00	3.00	2.00	2.00	0.3
Eosinophils	6.00	3.00	4.00	5.00	0.31
Monocytes	-	-	1	-	0.00