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Haematological Responses of Layer Chickens Fed with Diets Containing Pito Mash Treated with Cocoa Pod-Husk Ash Extract

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Abstract

The study aimed to determine the optimum level of cocoa pod–husk ash extract treated pito mash that can be incorporated in grower and layer chicken diets without adverse effect on the haematological indices and for that matter the health status of the chickens. A total of 176 eight-week old Lomann brown layers were used

in the feed trial. The chicks were randomly allocated to the 4 dietary treatments of 44 chicks per treatment and replicated 4 times. The experimental treatments were given weighed amount of both the grower and the layer diets at the recommended period of time during the experimental period. A complete randomized design (CRD) was applied in which the dietary treatments included 0, 5, 10 and 15 % level of the cocoa pod – husk ash extract treated pito mash. Feed and water were provided *ad libitum.* Blood cellular indices measured includedHb, HCT, RBC, WBC, MCV, MCH, and MCHC. Results showed that with exception of final mean cell haemoglobin(MCH), the initial and final mean cell haemoglobin concentration(MCHC) all the other haematological indices were not significantly ($P > 0.05$) influenced by the dietary treatments. The final values for all the mentioned indices were consistently lower than before the experiment, yet they fall within the recommended values of healthy chickens. Cocoa pod-husk ash extract treated pito mash inclusion in grower and layer diets up to 15 % is therefore recommended.

Keywords: haematological indices, health status, feed trial, RBC

1 Introduction

Pito mash is a by-product of locally brewed gin from sorghum grains. The by-product like all other dried brewers spent grains, is a concentrated material of protein and dietary fibre highly variable ingredient, whose composition and nutritional value depend on the species used, on the industrial process (temperature, fermentation, etc) and on the method of preservation (Crawshaw,2004). Asurmendi*et al*. (2013) observed that the by-product is palatable and readily consumed when in good condition. It could therefore be an alternative feed energy source and a potential substitute for convectional energy feed stuff such as maize, millet, etc. However, the inability of farm animals especially monogastrics to utilize diets containing large quantities of pito mash may be partially due to the high dietary fibre content.

Farmers, notably, those in the poultry industry, can brief a sigh of relief since, treatment of fibrous feed ingredients with organic alkali substances such as cocoa pod-husk, cassava/plantain/ yam peel ash extract, cocoa pod and palm bunch ash instead of inorganic substances such asNaOH to improve their feed value has been reported. Incorporating certain recommended levels of organic alkali-treated fibrous materials including pito mash has yielded positive results, in terms of egg laying performance, egg quality characteristics, carcass yield, etc. (Adua*et al.* 2012., Oladunjoye*et al.* 2010). In spite of these scientific achievements, there are conflicting reports regarding their positive or negative effects onthe haematological parameters and for that matter, the overall health status of chickens fed with diets containing alkali-treated feed material.The study was therefore undertaking to evaluate the effects of partially replacing maize in layer diets with different levels of cocoa pod husk ash-extract treated pito mash.

2 Material and Methods

One hundred and seventy six (176) chicks at 8 weeks old were used in this experiment for a 49-week nutritional study including two weeks adjustment period to the experimental diets. They were transferred from the brooder house to the treatment cages of deep litter system measuring 2.30 x 1.30m in width and length per cage. A wood rectangular feeder and a plastic round drinker were placed in each of the cages. The experimental chicks were kept in the cages until the feed trial was terminated. The experimental design was the complete randomization (CRD) in which the experimental diet was the source of variability. There were four treatments and four replicates. The 176 chickens were divided into four groups of forty four chicks each and randomly assigned to the four diets (Table 1 and 2). Each group was further subdivided into four replicates of eleven chicks each (representing $0.27m^2$/bird) and allocated to individual cage throughout the experimental period. The control group had no alkali – treated pito mash in the diet.

The feeding took off immediately the initial weights of the birds had been taken at 8weeks old, after been fasted for about 13hours by withdrawing feed only. This was to flush out the guts of the chickens previous feed residues. Each replicate of eleven chickens was supplied with 6Kg feed/week, representing 0.08Kgfeed/bird/day and 1.5litters of water once daily. The chickens were provided with grower diets from 8-21weeks old and layer diets from 22–49weeks old. The quantity of feed and water were increased as the chickens got older. To maintain adequate sanitation, drinkers were cleaned every morning and disinfect weekly before supplying the day's measured water. Likewise, the feed troughs were cleaned weekly before the feed were also supplied.

Table 1.Composition of the experimental diet for growers (8-22weeks)

	% Level of DPM			
	0	**5**	**10**	**15**
Maize Treated	52.8	48.8	43.8	39.5
pito mash	0	5.0	10	15
Wheat bran	23	23	23	23
Fish meal	7.5	5.3	4.0	2.0
Vegetable Oil	2.4	3.6	4.9	6.2
Soya bean meal	8.0	8.0	8.0	8.0
Dicalcium phosphate	2.0	2.0	2.0	2.0

Table 1. (Continued): Composition of the experimental diet for growers (8-22weeks)

Oyster shell	3.5	3.5	3.5	3.5
Methionine + Lysine	0.05	0.05	0.05	0.05
Salt	0.5	0.5	0.5	0.5
Vit premix	0.25	0.25	0.25	0.25
TOTAL (Kg)	**100**	**100**	**100**	**100**

Proximate Analysis

Table 2. Composition of the experimental diets (layers22-34weeks)

INGREDIENT	**% Level of DPM**			
	0	5	10	15
Maize	51.0	46.0	40.6	37.5
Dried pito mash	0	5.0	10	15
Wheat bran	16	16	16	16
Fish meal	9.0	7.5	6.5	4.0
Vegetable Oil	2.5	4.0	5.4	6.0
Soya bean meal	11	11	11	11
Dicalcium phosphate	2.0	2.0	2.0	2.0
Oyster shell	7.5	7.5	7.5	7.5
Methionine+lysine	0.25	0.25	0.25	0.25
Salt	0.5	0.5	0.5	0.5
Vit premix	0.25	0.25	0.25	0.25
TOTAL (Kg)	**100**	**100**	**100**	**100**
Proximate Analysis				
Crude protein (%)	17.9	18.3	18.2	17.9
Crude fiber (%)	2.45	2.47	3.01	3.70
Ether Extract (%)	4.00	4.50	5.00	
Ash content (%)	11	12	12	12.50
Moisture content (%)	13.00	13.00	12.50	13.00
Calculated Values				
ME (Kcal/kg)				
Calcium	2665.0	2676.2	2677.9	2647.3
phosphorus	3.7	3.7	3.7	3.6
	0.7	0.9	0.7	0.7

Six chickens were randomly selected from each replicate, leg – banded in three separate groups of two birds and weighed on a spring balance. The initial body weights were between 347 and 352g. The birds were fed the experimental diets for 39 weeks excluding 2weeks of pre-data collection period and had free access to feed and water throughout the experimental period.

2.1 Blood sample collection

The determination of the haematological values of the experimental chickens was done at week eight for the initial values. These were carried out soon after allocating them into their respective treatment cages, prior to dietary treatment to

establish the status of the blood parameters of interest. At the sampling period, three birds were randomly selected from each replicate totaling forty-eight chickens. Two millimeters of blood sample was collected from each of the three chickens via the wing web veins of each chicken with the use of 23-guage needle being fixed to a 3ml syringe (Campbell, 1995). Soon after the blood samples were taken, 1ml from each sample was immediately transferred to a glass tube containing ethylene diamine tetra acetic acid – EDTA and then thoroughly shaking to mix both blood sample and EDTA together (Jain,1993), to prevent coagulation. The sample glass tubes were carried in ice container filled with ice block to prevent the deterioration of the blood samples and taken to the Hospital laboratory of the Kwame Nkrumah University of Science and Technology, (KNUST), Kumasi, for the blood analysis.

The haematological analysis was carried out at the hospital laboratory, by the use of automatic analyzer (SYSMEX – KX -2IN). The blood samples after mixing with relevant reagent were fed in turn into the analyzer. The sample was then siphoned and the results shown on the screen of the analyzer.

3 Results and Discussion

Table 3.Haematological responses of the experimental chickens fed with dietary treatments

PARAMETRES	**T1**	**T2**	**T3**	**T4**	**SEM.**	**SIGN.**
Initial Hb(g/dl)	10.68	10.47	10.60	10.68	0.302	NS
Final Hb(g/dl)	9.62	9.25	9.80	9.55	0.675	NS
Initial HCT (%)	34.60	34.58	34.34	35.62	0.675	NS
Final HCT (%)	32.52	31.25	32.55	35.08	1.043	NS
Initial Rbc($x10^{12}$/l)	2.525	2.500	2.475	2.525	0.036	NS
Final Rbc($x10^{12}$/l)	2.375	2.400	2.375	2.400	0.086	NS
Initial Wbc($X10^{9}$/l)	252.93	252.35	251.35	251.35	0.798	NS
Final Wbc($X10^{9}$/l)	252.80	257.60	262.60	262.10	10.62	NS
Initial MCV(Fl)	135.43	135.75	136.00	135.00	0.842	NS
Final MCV(Fl)	136.60	137.90	137.50	135.32	1.553	NS
Initial MCH(Pg)	41.20	41.15	42.50	42.17	0.425	NS
Final MCH(Pg)	38.00^{c}	39.98^{a}	41.00^{b}	40.20^{b}	1.282	*

Table 3. (Continued): Haematological responses of the experimental chickens fed with dietary treatments

Initial MCHC(g/dl)	30.63^{a}	30.48^{a}	30.13^{b}	30.41^{b}	0.167	*
Final MCHC(g/dl)	30.43^{a}	30.32^{a}	29.75^{b}	29.52_{b}	0.513	,*

a,b,c means within the same row bearing different superscripts are significantly different. (* P<0.05). NS= Not significant. SME = Standard er

Table3 shows the mean initial and final levels of haemoglobin(Hb), haematocrit(HCT), red blood cells counts(Rbc), white blood cell counts(Wbc), mean cell volume(MCV), mean cell haemoglobin(MCH), and mean cell haemoglobin concentration(MCHC). The average Hb Ranged from 9.60 – 10.68g/dl. The mean HCT levels ranged from 31.20 – 35.62%., The average Rbc counts ranged from 2.375 – 2.47 ($x10^{12}$/l). The mean Wbc counts ranged from 251.35 – 262.60 ($x10^{9}$/l). The MCV had ranges between 135.00 – 137.50FL.
The MCH ranged between 38.00 – 42.17Pg, whilst the average MCHC values ranged between 29.52 – 30.63g/dl. The results show that haemoglobin concentration(Hb), haematocrit(HCT), red blood cells count(Rbc) and mean cell values(MCV) of chickens recorded no significant differences (P>0.05) for both initial and final values. However, the final values observed for these parameters were lower than the initials. Again no significant (P > 0.05) effects of the experimental diets were observed on initial and final white blood cell (wbc) counts, however, final mean cell harmoglobin (MCH) and both initial and final values of mean cell haemoglobin concentration(MCHC) recorded significant (P < 0.05) differences among treatments.It could be observed from the study that with exception of final mean cell haemoglobin(MCH), the initial and final mean cell haemoglobin concentration(MCHC) which were significantly (P < 0.05) affected, all the other haematological parameters were not significantly influenced by the dietary treatments. However, the final values for all the mentioned indices were consistently lower than before the experiment (Table 3). Fleming and De Silva (2008) suggested that age, gender and altitude could be some of the possible causes for different haematological levels.
The trend shown in these values could be related to neither gender nor altitude in this present study, since all the experimental chickens were layers of the same strain reared under the same altitude and environmental conditions. One of the possible causes for this difference in thehaematological indices could be the age difference. Blood samples for the analysis were taken at different stage of growth, with the initial sample taken at 8weeks of age before the commencement of the feed trials. Whilst the final was collected at 47weeks i.e. Two weeks prior to the termination of the experiment.

The haematological parameters that registered significant difference (Table 3),

similarly recorded significantly ($P < 0.05$) lowered values in all cases. This finding is in agreement with the previously reported data Aduaetal. (2012). It could also be observed that the final Hb, HCT and Rbc were lower than the initial values. This could mean that there is an inherent positive correlation among these parameters, implying that these are affected by the same factors in the same way, and that their levels indicate the nutritional and health status of the chickens as indicated by Chinekeetal. (2002). One significant observation about the results is that, though the final haematological values were lower as indicated earlier, the values fell within the normal range for chicken as reported by Mitruka and Rawnslay (1997). This could mean that the experimental birds were neither anaemic nor suffering from any physiological disorders before and throughout the experimental period and that the alkali treatment might have elicited just a minimal dietary effect on blood profile of the experimental chickens.

4 Conclusion

Cocoa pod-husk ash extract treated pito mash inclusion in layer diets resulted in decreased final Hb, HCT, Rbc, MCH and MCHC, but increased in final Wbc (except in control), MCH. Values recorded for all these blood parameters fall within the normal range for healthy chickens, thus apparently indicating that the chickens were in healthy conditions pre and post- experimental period.

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