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Blood profile of broiler finishers fed diet with graded levels of indomie noodle waste meal in humid tropics

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ABSTRACT

The effect of Indomie Noodle Waste Meal (IWM) based diet of the haematology and serum biochemistry of Broiler Finisher was investigated. One hundred and fifty unsexed Hypecco strain of Broilers were randomly allotted into five Isocaloric and Isonitrogenous dietary groups with graded levels of IWM to replace maize on weight basis in a Completely Randomised Design(CRD).Treatment 1 (T1),T2,T3,T4 and T5 contained IW at 0%,25%,50%,75% and 100% respectively. The experiment lasted for five weeks (5^{th} -10^{th} week). Dietary treatment started at 5^{th} week of age and blood collection started at the onset of the dietary treatment and weekly thereafter. Haematological parameters investigated were Haemoglobin (Hb) concentration, Packed Cell Volume (PCV), White Blood Cells (WBC), Red Blood Cells (RBC) while the erythrocyte indices were calculated. Serum metabolites analysed for were Total Protein (TP), Albumin, Globulin, Uric acid, Calcium, Glucose, Creatinine, Bilirubin and Cholesterol.

Hb, PCV and the erythrocyte indices were significantly *($p<0.05$)* lowered by the IWM inclusion but not adversely while serum TP, Albumin, Globulin, Calcium and Cholesterol were significantly *($p<0.05$)* elevated with the level of IWM inclusion.IWM can be used to replace maize in the diet of Broiler finisher chickens the level of which must not exceed 50% to avoid higher serum cholesterol level.

Introduction

Maize constituted the highest proportion of most compounded ration for livestock especially non-ruminant animals taking about 40-60% of such diets(Onimisi and Dafwang,2010). Any effort to substitute maize with cheaper feed ingredients is likely to reduce the total cost of production significantly(Okah,2004; Akinmutimi,2004). Broiler chickens require high energy based diets the best of which can be gotten from maize and other related but expensive cereals.

Many agro-industrial by products (AIBs) have been exploited as substitutes for maize.The use cassava peel meal as cheaper substitute for maize in the diets of monogastrics was earlier reported by Obioha and Abnikwe(1982),Tewe and Kasali(1986) so also the utilization of yam peel meal can be used to replace maize as an energy source in the diet of laying quails to the level of 20% Edache *et al*,(2010).

Furthermore, it was conluded by Okereke *et* al(2010) that Livingstone (*Plectranthus esculentus)* can be used up to 30% in broiler finisher feed to replace maize without any detrimental effect on the on the bird and that maize can be replaced with orange waste meal in the diets of Broiler starters up to 15% (Offong *et* al,2010)while naturally fermented sweet orange peel meal can be incorporated into the diets of Broiler chickens at 30% maize replacement without any adverse effect on the birds(Oluremi *et al*,2010).

Various human food based industrial wastes have been exploited for livestock feeding to replace maize. Food waste products such as biscuit waste meal, burnt maize meal and macro cassava flakes and Indomie Noodle Waste meal have been incorporated into the feed of non-ruminants to replace maize. It has been earlier reported that IWM can be used to replace maize to the level of 75% in the ration of egg-type chickens without adverse effect on the performance of the birds (Eniolorunda *et al*,2008).Also, IWM can be used to replace maize in the diets of Broiler finishers at 50% level to get a cheaper and equally effective ration (Alabi and Ayoola,2010).

Meanwhile, the metabolizable energy(ME) and crude protein content of IWM are closer to that of maize(Alabi and Ayoola,2010) hence the need to investigate further into the haematological profiles and serum metabolites of Broiler chickens fed with graded level of IWM at finisher phase.

Materials and Method

Two hundred (200) unsexed Hypecco strain of Broilers were purchased from a reputable hatchery in Nigeria. They were brooded for three weeks during which commercial Broiler starter mash and water were provided *ad libitum* while other management practices in terms of medication and vaccination were strictly observed.

Five isocaloric and isonitrogenous experimental diets were formulated at graded levels with IWM replacing maize on weight basis. At the end of the third week, one hundred and fifty (150) broiler chicks were weighed individually and randomly allotted to the five dietary groups with thirty (30) chicks each.

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The groups were further subdivided into three (3) replicates of ten (10) chicks each in a Completely Randomized Design (CRD). The dietary groups are: T1 (control with 100% maize and no IWM), T2 (75% maize and 25% IWM), T3 (50% maize and 50% IWM), T4 (25% maize and 75% IWM) and T5 (100% IWM and no maize).

Blood collection started at fourth week and was carried out weekly till the 10^{th} week of age of the birds. Blood was collected from three birds per replicate on weekly basis via the wing web vein with the use of micro syringe. For haematology, about 5ml of blood was collected per bird into labelled bottle containing a speck of Ethylene-diamine-tetra acetic acid (EDTA) which is an anticoagulant and samples were stored at -20^{o}c until analysis which was done not later than three hours after collection as earlier recommended by Jain(1986). For serum metabolites, separate blood sample was collected per bird into bottle devoid of the anticoagulant. Haematological parameters investigated were Packed Cell Volume (PCV), Haemoglobin Concentration (Hb), White Blood Cells (WBC), Red Blood Cells

(RBC). Mean Corpuscular Volume (MCV), Mean Cell Haemoglobin (MCH) and Mean Corpuscular Haemoglobin Concentration (MCHC) were calculated as earlier described by Lamb(1981). Serum metabolites analysed for were Glucose, Cholesterol, enzymes such as Aspartate Transferase, Alanine amino transferase, acid phosphatase and alkaline phosphatase, serum uric acid, Total Protein(TP), Albumin, Globulin, Creatinine and Bilirubin.

Statistical Analysis

All data generated were subjected to Analysis of variance (SAS,1999). The treatment means where significant were separated using the Duncan"s option of the same software.

Results

Table 1 shows the gross composition of the experimental diets with the calculated values of metabolizable energy (Kcal/kg) and crude protein (%).

Table 2 shows the haematological profile of Broiler finisher chickens fed graded level of IWM as replacement for maize. No significant (*p>0.05)* difference was observed between the mean Hb concentration of birds in treatments 1, 2, 3 and 4 but they differed significantly(*p<0.05)* from those in treatment 5. Hb values ranged from 7.50g/dl (T5) to 9.29g/dl (T1 and T3).The value was decreasing with the inclusion of IWM in the diets. The PCV if T1,T2, T3 and T4 did not differ significantly (*p>0.05)* from each other but they differed significantly(*p<0.05)* from the mean value for birds in T5 with 100% IWM. The above pattern was also observed for the MCH and MCV while the RBC and MCHC of the chickens were not significantly (*p>0.05)* influenced by the dietary treatments.

Table 3 shows the effect of replacing maize with IWM on the serum metabolites of the Broiler chickens at finisher phase. The TP was significantly (*p>0.05)* affect by the dietary treatments. Birds on T5 had the highest valued of 6.90g/dl while the birds in control group had the lowest value of 4.50g/dl and no significant (*p>0.05)* difference was observed between the TP values of birds in T2 and T3. Serum albumin was also affected by the dietary treatments significantly (*p<0.05)*. Birds in T5 had the highest value of 3.65g/dl with the least TP of 3.20g/dl from the control group while no significant (*p>0.05)* difference was observed between the mean values for birds in T2, T3 and T4. The above trend was also observed for the values of the serum calcium. For serum globulin, inclusion of the IWM in the diets of the chickens significantly (*p<0.05)* affected the values with birds in T5 having the highest mean value of 3.25g/dl while birds in control group had the least value of 1.30g/dl. This trend was also noted for the serum cholesterol with birds in T5 having the highest value of 338.00mg/dl. Meanwhile the serum cholesterol level was increasing with the level of IWM inclusion in the diets. However, serum uric acid, creatinine and bilirubin were not significantly (*p>0.05)* affected by the dietary treatments. Furthermore, the values of the serum glucose were decreasing with the inclusion of IWM in the diets of the Broiler chickens. No significant (*p>0.05)* difference was observed between the mean values for birds in T2 and T3, T4 and T5 but these pairs differed from each other and from birds in T1 significantly (*p<0.05)*. Meanwhile, serum glucose values ranged from 125.00mg/dl to 154.00mg/dl (T1).

Discussion

The birds were given rations based on the specifications of metabolizable energy, crude protein and crude fibre as earlier suggested by Olomu(1979). Inclusion of IWM in the diets of BF caused reduction in the Hb concentration, PCV while MCH, and MCV which were absolute values calculated from Hb and PCV also got reduced. This revealed that haemoglobin production in chickens may be more favoured by maize-based diets so also the PCV although their values for birds on higher proportion of IWM were still within the normal range earlier reported by Mistruka and Rawnsley(1977).

The WBC was not affected by the dietary treatments thereby indicating that no pathological effect was induced by the IWM inclusion in the diets hence the health status of the birds was okay .The erythrocyte constants such as MCH, MCV and MCHC were not negatively affected by the IWM inclusion as their values were still within the normal range as suggested by [16]. These constants were being used to describe the characteristics of individual RBC in terms of size, shape and haemoglobin content.Meanwhile, the serum metabolites profile changed with the inclusion of IWM in the diets of the Broiler finishers. The TP, Albumin and Globulin increased with the level of inclusion. This may be attributed to the high nutritive values of the raw Indomie Noodle from which IWM was obtained and which was reported by [11] to be rich in digestible protein.

The calcium content of IWM is more than that of maize (Eniolorunda *et al*,2008) hence its elevation in the serum of the Broiler finishers and also the higher serum cholesterol content by virtue of the higher fatty acid and oil fractions of IWM than maize. However, the serum glucose was lower with IWM inclusion because the ME of IWM is lower than that of maize.

Conclusion

The results of the experiment revealed that IWM can be used to replace maize in the diets of Broiler finishers without any adverse effect on the haematological parameters and serum metabolites of the birds although the serum cholesterol may be slightly elevated, therefore, the inclusion at 50% level to replace maize as recommended by Alabi and Ayoola(2010) is being corroborated by these findings to control the cholesterol level of the serum and at the same time making it to be cost effective.

Table 1: Gross Composition of the Experimental Diets

	Treatments				
Ingredients(kg)	T1	T2	T3	T4	T5
Maize	57.00	42.75	28.50	14.25	0.00
Indomie Waste	0.00	14.25	28.50	42.75	57.00
Wheat Offal	15.50	16.50	17.30	17.20	17.80
Full fat Soya	17.00	16.20	16.00	15.90	15.50
Fish meal	6.00	5.80	5.20	5.40	5.20
Oyster Shell	1.00	1.00	1.00	1.00	1.00
Bone Meal	3.00	3.00	3.00	3.00	3.00
Salt	0.25	0.25	0.25	0.25	0.25
*Broilers Premix	0.25	0.25	0.25	0.25	0.25
Total(Kg)	100.00	100.00	100.00	100.00	100.00
Metionine	0.10	0.10	0.10	0.10	0.10
Lysine	0.05	0.05	0.05	0.05	0.05
Calculated Values:					
Metabolizable Energy (kcal/kg)	2906.03	2912.60	2916.86	2920.57	2925.41
Crude Protein(%)	19.43	19.44	19.44	19.45	19.46

*Premix to provide the following per kg of feed; Vit A –700 iu, Vit D3 – 1400mg,; Vit E – 11mg; Vit K – 2mg; Riboflavin- 15mg; Nicotinic acid – 10mg; Panthothenic acid – 7mg; Cobalamin – 0.08mg; choline chloride – 950mg; folic acid – 1.8mg; Biotin – 1.5mg; Iron – 25mg; Manganese – 90mg; Copper – 2mg; Zinc – 50mg; Cobalt – 1.20mg and Selenium – 0.1 mg.

Table 2: Effect of Replacing Maize with Indomie Noodle Waste Meal in the diets of Broiler Finishers on the Haematological Parameters.

	Treatments					
Parameters	1	2	3	4	5	SEM
Hb (g/dl)	9.20^{a}	8.50^{a}	9.20^{a}	8.80^{a}	7.50^{b}	0.70
Packed Cell Volume (%)	29.00^{a}	27.00^{a}	29.00^{a}	28.00^{a}	25.00^{b}	2.50
White Blood Cells(103/ul)	2.00	2.10	2.10	1.90	2.00	0.30
Red Blood Cells(106/ul)	2.65	2.67	2.65	2.68	2.65	0.20
Mean Corpuscular Haemoglobin(Pg)	3.47^{a}	3.18^{a}	3.47^{a}	3.28^{a}	2.83^{b}	0.30
Mean Cell Volume(fl)	10.49^{a}	10.11^{a}	10.94^{b}	10.44^{a}	9.05^{b}	0.85
Mean Corpuscular Haemoglobin Concentration (%)	31.00	31.00	32.00	31.00	31.00	2.00

abcd: Means with different superscript are significantly different ($p<0.05$).
SEM: Standard Error of Mean

Table 3:Effect of Replacing Maize with Indomie Noodle Waste Meal in the diets of Broiler Finishers on the Serum Metabolites.

	Treatments					
Parameters	1	2	3	4	5	SEM
Total Protein(g/dl)	4.50^{d}	5.22^{c}	5.50^{c}	6.20^{b}	6.90^{a}	0.40
Albumin(g/dl)	3.20^{c}	3.45^{b}	3.49^{b}	3.50^{b}	3.65^{a}	0.10
Globulin(g/dl)	1.30^{e}	1.77^{d}	2.01^{c}	2.70^{b}	3.25^{a}	0.08
Uric Acid(mg/dl)	18.64^{c}	19.35^{bc}	19.86^{b}	20.45^{b}	21.15^{a}	0.60
Glucose(mg/dl)	154.00^{a}	136.00^{b}	133.00^{b}	127.00^{c}	125.00^{c}	3.00
Creatinine(mg/dl)	1.48	1.50	1.50	1.51	1.51	0.05
Bilirubin(mg/dl)	0.15	0.16	0.16	0.17	0.16	0.02
Cholesterol(mg/dl)	154.00^{e}	185.00^{d}	200.00^{c}	307.00^{b}	338.00^{a}	4.50

abcde: Means with different superscript are significantly different ($p<0.05$).
SEM: Standard Error of Means

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