EFFECT OF PALM OIL ON HAEMATOLOGICAL AND SERUM LIPID PROFILE OF BROILER BIRDS FED NOODLE BASED DIETS

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ABSTRACT
An eight-week feeding trial using 240 5-day-old Hubbard flex broiler chicks was conducted to assess the effect of feeding graded levels of indomie noodle waste (INW) diets containing palm oil on heamatological parameters and serum lipid profile of birds. Birds were allotted five treatments containing three replicates having sixteen birds per replicate in a completely randomized design. Five diets were compounded containing indomie noodle waste at 0, 25, 50, 75 and 100% replacing maize in the diets with palm oil deceasing as INW inclusion increased in the diets. Feed and water provided ad libitum. At the end of the experiment, blood samples were collected from severed jugular veins of two birds per replicate and subjected to laboratory analysis for Total Cholesterol (TC), High Density Lipoproteins (HDL), Low density lipoproteins (LDL) and Triglyceride (TG). Results showed that increase in INW in the diets of broilers tend to increase total cholesterol and triglyceride, favors high density lipoproteins, and lowered values for low density lipoproteins though there was no statistical difference (P>0.05) across the treatments. Broiler diets can contain INW up to 50% as to control elevations in values of TC and TG.
KEYWORDS: Diets, Performance, lipoproteins, Indomie Noodle Waste

INTRODUCTION

Dietary fats are used in poultry to increase the energy density of the diets and to reduce heat production by birds in hot climate (Squires *et al.*, 1991). Palm oil and its products are classified as high energy feed which are technically and economically feasible to be used in broiler diet partially replacing the corn. Each unit of palm oil and its component used in the ration can replace two units of corn in terms of energy. Thus 10% of palm oil products added to the feed will provide energy equivalent to 20% of the corn in its formulation in same management system (Parvez *et al*., 2010). The feed industry in Nigeria is faced with acute shortages and high prices of feed ingredients, which is currently responsible for increases in the cost of livestock feeds and animal protein for human consumption which has led to replacing some percentage of maize or all with agro industrial by-products such as maize offal, wheat offal, rice offal, cassava peel and brewers dried grain (Ibiyo and Atteh, 2005). This replacement will diminish dependence of livestock on grains that can be consumed by humans as reported by Grasser *et al.* (1995). Blood parameters are important patho-physiological indicators of the health status of animals and have been an indispensable tool in the diagnosis and treatment of many diseases (Omole *et al*., 2013)

Objectives

- To determine the effect of palm oil on haematological parameters of broiler chickens fed noodle based diets
- To determine the effect palm oil on serum lipid profile of broiler chickens fed noodle based diets

MATERIALS AND METHODS

Location

The experiment was conducted at the Research and learning farm, Department of Animal Science, Ahmadu Bello University, Samaru-Zaria within the Northern guinea savanna zone on latitude 11^0 $9^{'}$ 45"N and longitude 7^0 38' 8"E,on an altitude of 610m above sea level (Ovimaps, 2012).

Feed and management

Five isocaloric and isonitrogenous starter (CP=23.6% ME=2910Kcal/Kg) and finisher (CP=23.6% ME=2910Kcal/Kg) diets represented as Treatments 1,2,3,4 and 5 were compounded with Indomie noodle waste replacing maize at 0, 25, 50, 75 and 100%, respectively with palm oil inclusion. Birds

were raised in a deep litter poultry house with feed and water provided *ad libitum*. Heat and light were provided.

Experimental Design

A total of 255-day-old chicks were used for this study. The chicks were randomly allocated to five dietary treatments with three replicates containing 17 birds per pen/replicate in a completely randomized design.

Blood evaluation

At the end of the experiment, 2mls of blood was collected after jugular vein of birds were severed, into sterile universal bottles containing anti-coagulant ethylenediamine tetra acetic acid (EDTA). The samples were taken to the haematology laboratory, Faculty of Veterinary Medicine, Ahmadu Bello University Zaria, for analysis of total protein (TP), haemoglobin count (Hb) differential blood count, packed cell volume (PCV) and serum lipid profile.

Another 2mL of blood was collected into sterile bottles. Serum was separated at the haematological laboratory of Faculty of Veterinary medicine before the serum lipid profile that accounted for Total Cholesterol (TC) High Density Lipoproteins (HDL), Low Density Lipoproteins (LDL) and Triglycerides (TG) was carried out.

Statistical Analysis

Data obtained from the trial was subjected to analysis of variance (ANOVA) using the General Linear Model procedure of statistical analysis system (SAS, 2002). Significant differences among treatment means were separated using the Duncan's Multiple Range Test.

Results

Heamatological parameters

Table 1 shows the effect of palmoil on haematological parameters of birds fed INW based diets. Dietary treatments had significant ($P<0.05$) effect on pack cell volume (24.67-28.33%) and hemoglobin (8.20-9.43 g/dL) except for Total protein and Total white blood cell. The pack cell volume of treatments 1,3.4 and 5 did not differ significantly ($P>0.05$) but varied significantly ($P<0.05$)with the mean values in treatment 2 except for treatment 4 that was statistically the same with treatment 2. The above pattern was observed for haemoglobin values. The mean values of Total white blood cells increased with lower palm oil inclusion and increased inclusion of indomie noodle waste but it did not affect the treatments significantly ($P>0.05$). Monocytes (%) and Hetrophils for treatment 5 were significantly ($P<0.05$) different from treatments 1,2,3,4 except the Hetrophils values of treatments 1 and 5 that were not significantly ($P>0.05$) different. Eosinophils values had no significant effect on treatments 1, 2 and 5 though treatments 1 and 5 differ significantly ($P<0.05$) with treatments 3 and 4.

DISCUSSION

The results revealed that TBWC, TP and Lymphocytes in all treatments were relatively the same. PCV and HB are major and reliable indicators of various sources of stress (Rainza-Paiva *et al*., 2000) and the presence of anti nutritional factors decreases these parameters (Osuigwe *et al*., 2007). The values obtained for PCV and HB in treatments 1 (0%INW) and 3 (50% INW), were statistically and numerically the same (PCV:27.33 and HB:9.07, respectively) which agreed with the findings of Alabi *et al*., 2012, who recorded the same value of 29% for PCV and 9.20g/dl HB for birds fed 0% and 50% indomie noodle waste. The fluctuating increase in values obtained in this study fell within the normal range as cited by Mistruka and Rawnsley (1977). Higher PCV values obtained in broiler birds fed the highest inclusion of INW with less palm oil is indicative of good nutritional status as reported by Lala *et al*. (2009) who recorded higher PCV value in cockerels fed the highest inclusion of INW. Contrary to the above findings, Alabi *et al*. (2012) mentioned decreasing values for PCV and HB as indomie waste increased in the diets though values were within the normal range. TWBC and TP were not significantly affected by dietary treatments. Although TP increased with increasing INW (less palm oil) in diets which may be attributed to the high nutritive value of raw instant noodles and rich digestible proteins as reported by Eniolorunda *et al*. (2008) and Alabi *et al*. (2012). White blood cells play important role in defending the body against disease-causing pathogens and a decrease in white blood cells count, reflects a decline in the production of WBC for defensive action against infections (Afolabi *et al*., 2003). The values obtained for TWBC was statistically the same across the treatments

though values were increasing as INW increased which indicates that there was increased production of TWBC therefore, no negative pathological effect was induced by the INW inclusion in the diets.

Table1: Effects of palm oil on haematological parameters of broiler birds fed diets containing Indomie Noodle Waste

Parameters	Trt 1 0%INW	Trt 2 25%INW	Trt 3 50%INW	Trt 4 75%INW	Trt 5 100%INW	SEM	LOS
*PCV (%)	27.33[a]	24.67[b]	27.33[a]	26.00[ab]	28.33[a]	1.22	*
*HB(g/dL)	9.07[a]	8.20[b]	9.07[a]	8.63[ab]	9.43[a]	0.41	*
*TP(g/dL)	3.33	3.20	3.47	3.27	3.60	0.29	NS
*TWBC	9.66	10.07	10.13	11.59	12.23	1.64	NS
Monocytes (%)	0.67[b]	0.67[b]	0.00[b]	0.67[b]	2.00[a]	0.53	*
Lymphocytes (%)	81.33	81.33	80.67	80.67	79	1.90	NS
Hetrophils (%)	13.00[ab]	13.67[a]	16[a]	14.67[a]	9.00[b]	2.15	*
Eosinophils (%)	5.00[a]	4.00[ab]	3.00[b]	1.67[b]	5.67[a]	1.24	*
Band (%)	0.00[c]	0.00[c]	0.33[bc]	0.67[ab]	1.00[a]	0.33	*

* PVC: packed cell volume, HB: hemoglobin, TP: total proteins, TWBC: total white blood cells.

Serum Lipid Profile

The result of serum lipid profile is presented in Table 2. The Total cholesterol (TC) of birds in this experiment revealed significant differences ($P<0.05$) with the highest values recorded in birds fed the control diet (having the highest amount of palm oil) which differed significantly ($P<0.05$) from birds of other diets containing less palm oil and more INW (treatments 2, 3, 4 and 5). Significant differences were not recorded in treatments 2,3 and 4 but there was numerical increase in total cholesterol as INW increased in the diets. Birds fed 100% INW(having the least amount of palm oil) which had the lowest values.

The values for High Density Lipoproteins (HDL) referred to as harmless lipoproteins showed no particular trend ranging between 69.61(trt5) – 36.09(trt2), with the control, 3,4 and 5 not different from each other but treatments 2(25% INW) and 3(75% INW) were statistically similar. Low Density Lipoproteins (LDL) of birds fed control diet had the highest values and it varied significantly with birds fed 75%INW diet (trt4). Birds on treatments 2, 3, 4 and 5 were statistically similar to each other. There was no significant ($P<0.05$) difference in the result of Triglyceride across the treatments, though values were decreasing as inclusion palm oil decreases and level of INW approached 50% and increasing values were recorded as inclusion level of INW exceeded 50% thereby creating a depression on values at 50%INW inclusion.

DISCUSSION

Total cholesterol is the total amount of cholesterol in the lipoproteins particles. Higher cholesterol contents are an indication of higher fat deposition (Tewe and Bokonga, 2001). Aderolu *et al*. (2011) recorded lowest cholesterol values in fishes fed diets containing the highest amount of indomie noodle waste which is similar to the values obtained in this experiment, with the lowest values in treatment 5 having least palm oil inclusion (121.81mg/dl) and the highest 251.36mg/dl (control having 3.98% palm oil). The differences could be attributed to the palm oil inclusion in the diets as Onibi *et al*., (2011) presented an increase in serum cholesterol contents as palm oil sludge increased in the diets of broiler chicken, which supports the fact that palm oil and sludge inclusion in diets could lead to hypercholesterolemic tendencies in birds. The addition of antioxidants during noodle production reduces cholesterol but the increasing values of total cholesterol with inclusion of indomie noodle waste is by virtue of high fatty acid and oil fraction (Alabi *et al*,. 2012) and low fibre contents of indomie noodle waste. Eniolorunda *et al*. (2008) reported a higher calcium contents in noodle waste than maize hence its evaluation in serum cholesterol. The values obtained for treatments 2, 3, 4 and 5 were within the desirable range (<200mg/dL) except for treatment 1 whose value was higher than the borderline (>240mg/dL).

The lipoprotein HDL takes cholesterol out of the blood stream to the liver for degradation. The similar relationship that exist in the results of treatments 1,4 and 5 indicates a highly desirable level of HDL, treatment 3 fell within the normal range (40-59mg/dL) while treatment 2 was within the range (<40mg/dL) that poses a higher risk of heart disease. The values obtained in treatments 4 and 5 suggest that indomie noodle waste can replace maize at 75% and 100% without lowering but rather

increasing the level of lipoproteins that do away with bad cholesterol. The highly digestible protein (Olomu, 1979) and nutritive value of indomie noodle waste may be the reason for the increasing values of HDL.

The Low Density lipoprotein (LDL) values for treatment 1 (114.08mg/dL) indicates high concentration of LDL in the plasma that is near optimum (100-129mg/dl). Antioxidants and Guar gum are components for the production of noodles. Antioxidants have lowering effect on LDL level or decreases the hepatic production of very low density lipoproteins which serves as a precursor of LDL in blood circulation (Grundy 1986). Guar gum used as thickener, emulsifier and stabilizer in noodle production serve as food supplement with high nutritional value for cholesterol reduction. These two (antioxidants and guar gum) could be the reason for lower LDL values as indomie noodle waste was included in the diets thereby, reducing the deposition of cholesterol into the blood stream or vessels. Values that are less than100mg/dL are termed as optimal values for LDL which was recorded in treatments 2,3,4 and 5. Sturkie (1986) stated that serum or plasma triglycerides of birds is strongly affected by heredity, nutrition, age, sex and environmental conditions, which could be the reason for the non significant values obtained in this study though the values fluctuated between 50.27 – 64.55. Values were within the normal range of less than 150mg/dL.

Table 2: Effects of palm oil on serum lipid profile of broiler birds fed diets containing Indomie Noodle Waste

Parameters (mg/dL)	Trt 1 0%INW	Trt 2 25%INW	Trt 3 50%INW	Trt 4 75%INW	Trt 5 100%INW	SEM	LOS
TC	251.36^{a}	154.68^{b}	164.35^{b}	174.02^{b}	121.81^{b}	26.29	*
HDL	65.74^{a}	36.09^{b}	54.14^{ab}	68.32^{a}	69.61^{a}	11.67	*
LDL	114.08^{a}	91.52^{ab}	96.68^{ab}	63.16^{b}	81.21^{ab}	20.29	*
TG	64.45	60.58	50.27	54.14	56.72	10.68	*

TC = Total Cholesterol, HDL = High Density Lipoproteins, LDL = Low Density Lipoproteins and TG = Triglycerides

Table 3: Composition of Noodle based starter diet containing palm oil

DietarylevelsofINW					
FeedIngredients(%)	**0%**	**25%**	**50%**	**75%**	**100%**
Maize	45.89	34.41	22.95	11.48	0.00
Indomienoodlewaste	0.00	11.48	22.95	34.41	45.89
Groundnutcake	30.85	30.00	29.13	28.31	27.50
Soyabeancake	12.00	12.00	12.00	12.00	12.00
Maizeoffal	3.00	4.65	6.30	7.90	9.35
Limestone	0.80	0.80	0.80	0.80	0.80
Bonemeal	3.20	3.20	3.20	3.20	3.20
Palmoil	3.00	2.20	1.41	0.64	0.00
CommonSalt	0.30	0.30	0.30	0.30	0.30
Lysine	0.35	0.35	0.35	0.35	0.35
Methionine	0.31	0.31	0.31	0.31	0.31
Premix*	0.30	0.30	0.30	0.30	0.30
Total	**100**	**100**	**100**	**100**	**100**
DeterminedAnalysis					
ME(kcal/kg)	2913	2912	2911	2911	2917
Crudeprotein(%)	23.69	23.68	23.67	23.67	23.65
Crudefibre(%)	4.17	4.14	4.12	4.09	4.04
Etherextract(%)	7.15	7.81	8.47	9.15	9.96
Cost/kgofdiet(₦/kg)	65.94	64.82	63.70	62.58	61.49

Table4:Compositionofnoodlebasedbroilerfinisherdietscontainin palmoil

	Dietary levels of INW				
Feed Ingredients (%)	**0%**	**25%**	**50%**	**75%**	**100%**
Maize	49.00	36.75	24.50	12.25	0.00
Indomienoodle waste	0.00	12.25	24.50	36.75	49.00
Groundnutcake	24.40	23.53	22.65	21.80	20.94
Soyabeancake	11.00	11.00	11.00	11.00	11.00
Maize offal	6.20	7.90	9.61	11.28	12.94
Limestone	0.90	0.90	0.90	0.90	0.90
Bonemeal	3.20	3.20	3.20	3.20	3.20
Palm oil	3.98	3.15	2.32	1.50	0.70
Common Salt	0.30	0.30	0.30	0.30	0.30
Lysine	0.42	0.42	0.42	0.42	0.42
Methionine	0.30	0.30	0.30	0.30	0.30
Premix*	0.30	0.30	0.30	0.30	0.30
Total	100	100	100	100	100
Calculated Analysis					
ME (kcal/kg)	2998	2998	2998	2998	2999
Crude protein(%)	21.20	21.20	21.20	21.20	21.20
Crude fibre(%)	4.11	4.07	4.04	4.01	3.97
Ether extract(%)	7.75	8.47	9.20	9.93	10.68

CONCLUSION

The study showed that palm oil inclusion in Noodle based diet did not affect the packed cell volume, heamoglobin and other hematological parameters negatively. High palm oil inclusion can impact the serum total cholesterol and higher LDL which could lead to hypercholesterolemic tendencies in birds, while other lipid profile parameters are within normal range. had the potential to replace maize up to 100% with good effects on High density lipoproteins, Total Cholesterol within range and lower Low density lipoproteins values**.**

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