REPLACEMENT VALUE OF SIEVED PALM OIL MILL EFFLUENT (POME) FOR MAIZE ON BLOOD PROFILE OF TURKEY POULT

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ABSTRACT
The experiment evaluates the replacement value of sieved palm oil mill effluent for maize on blood profile of turkey poult. The trial conducted at the Poultry Unit of Ladoke Akintola University of Technology Ogbomoso. One hundred and fifty (150) day old poults were used for the trials that lasted eight (8) weeks. Wet POME was collected, pressed and sun-dried, milled to replace 0% (control diet), 10%, 20% and 30% and 40% maize in diets 1, 2, 3, 4 and 5 respectively. Five dietary treatments groups of 30 birds each which were further subdivided into 3 replicates of 10 birds each in a Completely Randomized Design was used. Results shows that dietary substitution of sieved POME had no significant ($P>0.05$) effect on the Packed cell volume, Red blood cell counts, White blood cell counts and Mean Corpuscular volume across the dietary treatments. However, birds fed 40% sieved POME in replacement of maize had significantly ($P<0.05$) higher haemoglobin concentration (Hb) value (11.40g/dl) than other diets. Birds fed 30% sieved POME had significantly ($P<0.05$) higher total protein and globulin values (5.72g/dl, 3.52 g/dl) than in other diets. There were significant differences ($P<0.05$) among treatments for serum cholesterol, alanine aminotransaminase (ALT), and alkaline phosphatase (ALP). Highest cholesterol value (147.27mg/dl) was recorded for 40% sieved POME while lowest value (131.23mg/dl) was recorded for 0%. Conclusion, haematological parameters and serum biochemistry were all within the recommended values and thus shows that sieved POME did not have any detrimental effect on the health of the birds.
Keywords - POME, Turkey poults, Haematology, Serum, Sieved

INTRODUCTION
Turkeys (Meleagris gallopavo) are reared all over the world for their tasty and high-quality meat (Prabakaran, 2003). It originates from North America and has been introduced nearly worldwide including Nigeria. The massive production of these poultry species is increasing in many countries as an important source of animal protein due to its comparatively high percentage of protein and low percentage of fat (Ibrahim *et al*., 2002). Haematology is the scientific study of the natural functions and disease of blood. Haematological indices are those factors in the blood whose level is usually determined in order to assess the degree of well-being of animal (Kral and Suchy, 2000). It provides valuable information on the immune status of animals. Such information, apart from been useful for diagnostic and management purpose, could equally be incorporated into breeding programmes for the genetic improvement of indigenous chickens (Kral and Suchy, 2000). Haematological value of chickens is influenced by age, sex, breed, climate, geographical location, season, day length, time of day, nutritional status, life habit of species and other physiological factors (Swenson, 2002). Kral and Suchy (2000) reported that serum biochemical parameters provide valuable information on the immune status of animals. In our semi-arid environment, available reports on plasma chemistry data of blood are limited to those of fowl and guinea fowls, but that of turkeys are very scanty and information on them are useful for diagnostic and management purposes which could further be incorporated into breeding programmes for genetic improvement of our turkeys (Ibrahim *et al*., 2002). This experiment therefore evaluates blood profiles of turkey poult fed varied inclusion levels of sieved palm oil mill effluent

MATERIALS AND METHODS

The experiment was carried out at the Poultry Unit of Teaching and Research Farm, Ladoke Akintola University of Technology Ogbomoso. Wet palm oil mill effluent (POME) sample was collected from the effluent storage tanks of palm oil extraction factory into empty sacks. The sacks containing the wet effluent was put under hydraulic press in order to drain the residual water and oil. The sample was later manually pulverized and sun-dried on polythene sheets to prevent it from caking and going rancid before and during storage. The dried material was milled and then manually sieved using 0.5mm and 1mm sieve for starter and grower phases respectively to remove coarse fibrous materials in it. Five diets were formulated based on the nutritional requirement of turkey (8). Diet 1 was the control diet without POME. Diets 2, 3, 4 and 5 had 10%, 20%, 30%, 40% maize respectively substituted with POME in the control diet. The gross composition of the diets is shown in Tables 1 and 2. Total of one hundred and fifty (150) unsexed day-old local turkey poults from a reputable commercial hatchery was used for the experiment. The birds were weighed and randomly grouped into five (5) treatments of three (3) replicates. Each replicate contained ten (10) birds making a total of thirty (30) birds per treatment. The feeding trial lasted for eight (8) weeks. Vaccinations and medications were done as at when due. Fresh feed and clean water were given *ad-libitum*. The experimental design was Completely Randomized Design (CRD). At the end of the experiment two birds from each replicate were randomly selected, tagged and blood samples were collected through the wing web. The blood samples for haematology were collected into the bottle containing ethylene diamine tetra-acetic acid (EDTA) as anti-coagulants. The parameters determined were; Haemoglobin concentration (Hb), Red Blood Cell counts (RBC), White Blood Cell counts (WBC), Packed Cell Volume (PCV), Mean Corpuscular Volume (MCV), Mean Corpuscular Haemoglobin (MCH), Mean Corpuscular Haemoglobin Concentration (MCHC). The blood samples for serum biochemical measurements were collected into EDTA free tubes and allowed to clot for the separation of the serum from the clot. Total serum protein, serum albumin, globulin concentrations, cholesterol, creatinine, alkaline phosphatase (ALP), serum aspartate aminotransferase (AST) and alanine aminotransferase (ALT). Blood samples were collected using the procedure as described by Jain (1986). Data collected were analysed by One-way analysis of variance of a Completely Randomized Design using SPSS (2012) software and means were compared using Duncan's Multiple Range Test of the same package at $P<0.05$.

Table 1: Gross Composition of Experimental Turkey Starter Diets

	% of POME substituted for maize				
Ingredients	**0**	**10**	**20**	**30**	**40**
Maize	46	41.4	36.8	32.2	27.6
POME	-	4.6	9.2	13.8	18.4
TOTAL	**100**	**100**	**100**	**100**	**100**
Calculated values					
ME (Kcal/kg)	2852	2871	2890	2908	2927
Crude protein	27.9	28	28	28	28

POME = Palm oil mill effluent; ME = Metabolizable energy

Fixed ingredients - Soybean meal 30; Groundnut cake 15; Fish meal 2; Blood meal 3; Bone meal 2; Oyster shell 1; Salt 0.25; Premix 0.25; Methionine 0.25; Lysine 0.25

Table 2: Gross Composition of Experimental Turkey Grower Diets

	% of POME substituted for maize				
Ingredients	**0**	**10**	**20**	**30**	**40**
Maize	48	43.2	38.4	33.6	28.8
POME	-	4.8	9.6	14.4	19.2
TOTAL	**100**	**100**	**100**	**100**	**100**
Calculated values					
ME (Kcal/kg)	2900	2920	2939	2959	2979
Crude protein	26.3	26.3	26.3	26.3	26.4

POME = Palm oil mill effluent; ME = Metabolizable energy

Fixed ingredients - Soybean meal 28; Groundnut cake 13; Corn bran 3; Fish meal 2.5; Blood meal 2; Bone meal 1.5; Oyster shell 1; Salt 0.25; Premix 0.25; Methionine 0.25; Lysine 0.25

RESULTS AND DISCUSSION

The dietary substitution of sieved POME in replacement of maize had no significant (P>0.05) effect on the PCV, RBC, WBC and MCV across the dietary treatments. Higher Hb concentration recorded at 10%, 30% and 40% might have been as a result of dehydration. MCH of the birds fed 0%, 20% 30% and 40% sieved POME in replacement of maize were similar (51.77Pg, 51.59Pg, 52.46Pg, 52.64Pg) and significantly (P<0.05) lower than that from 10% (55.36Pg). MCHC from birds fed 0% (31.08g/dl) was similar to 10% (30.88g/dl) but significantly (P<0.05) lower than those fed 40% (32.76g/dl). The values from this result concurred with the report of Etuk *et al*. (2012); Denise (2000) for local turkey. Lower MCV values recorded from the groups that received POME might have been a result of poor dietary intake of Iron. However, Fluctuation in MCV, MCH and MCHC recorded in this result had also been observed in broilers (Talebi *et al*., 2005; Islam *et al*., 2004).

Table 3: Haematological Parameters of Turkey Poults Fed with Varied Substitution Levels of Sieved POME

	% Levels of POME substituted for maize					
Parameters	**0**	**10**	**20**	**30**	**40**	**SEM**
Packed Cell Volume (PCV) (%)	32.33	33.00	33.00	34.00	33.33	**0.29**
Haemoglobin (Hb) (g/dl)	10.47^{c}	10.83^{b}	10.27^{d}	10.70^{b}	11.40^{a}	**0.05**
Red Blood Cell (RBC) (10^{6}ul)	2.33	2.90	2.63	2.64	2.26	**0.11**
White Blood Cell (WBC) (10^{3}ul)	16.45	15.43	16.25	16.26	16.74	**0.26**
MCV (fl)	167.21	161.47	163.28	162.28	166.55	**1.20**
MCH (Pg)	51.77^{b}	55.36^{a}	51.59^{b}	52.46^{b}	52.64^{b}	**0.28**
MCHC (g/dl)	31.08^{b}	30.88^{b}	31.55^{ab}	32.22^{ab}	32.76^{a}	**0.21**

Means values with similar superscripts alphabet along the same row are not significantly (P > 0.05) different.

SEM = Standard Error of Mean; MCV = Mean Corpuscular volume; MCH = Mean Corpuscular Haemoglobin; MCHC = Mean Corpuscular Haemoglobin Concentration

Birds fed 30% sieved POME in replacement of maize had significantly (P<0.05) higher total protein and globulin values (5.72g/dl, 3.52 g/dl) than in other diets. Those that were fed 20% had the lowest value (5.20g/dl, 3.12g/dl). Albumin from birds fed 0% (2.28g/dl) was similar to 10% (2.17g/dl), 30% (2.20g/dl) and 40% (2.12g/dl) respectively and significantly (P<0.05) higher than those fed 20% (2.08g/dl). There were significant differences (P<0.05) among treatments for serum cholesterol, ALT, and ALP. Birds that received diet in which 40% maize was substituted with sieved POME had higher cholesterol in their serum than those fed control diet. The highest cholesterol value (147.27mg/dl) was recorded for 40% sieved POME while lowest value (131.23mg/dl) was recorded for 0%. Turkey poults that were fed sieved

POME were similar to those fed control diet in term of ALT. However, ALP did not follow any particular trend. There were no significant (P<0.05) difference in creatinine, urea and AST values across the dietary treatments. Higher urea values recorded at 10% (18.81m/dl) and 20% (18.87m/dl) might be a result of low blood flow to the kidney caused by dehydration. The total serum protein and globulin values were within the values reported for eight (8) weeks old turkey poults by Ogungbenro *et al*. (2013). Albumin values recorded varied (P<0.05) across the dietary substitution. Increased blood serum cholesterol values with increase inclusion levels of sieved POME might have been influenced by increased metabolizable energy and ether extract in the diets. Decreased serum urea recorded from 40% could be attributed to improved protein utilisation. Serum urea is assumed to indicate protein breakdown and higher urea value indicates poor dietary protein utilisation (Etuk *et al*., 2012). Values recorded for AST, ALT and ALP followed no trend and this disagree with the report of (Babatunde *et al*., 1987). However, the values recorded were within the values reported by Ogungbenro *et al*. (2013); Ibrahim *et al*. (2012). Higher levels of ALT and ALP recorded might be an indication of tissue damage.

Table 4: Serum Biochemistry of Turkey Poults Fed with Varied Substitution Levels of Sieved POME

	% Levels of POME substituted for maize					
Parameters	**0**	**10**	**20**	**30**	**40**	**SEM**
Total protein (g/dl)	5.42^{b}	5.44^{b}	5.20^{b}	5.72^{a}	5.37^{b}	**0.04**
Globulin (g/dl)	3.14^{b}	3.27^{b}	3.12^{b}	3.51^{a}	3.25^{b}	**0.03**
Albumin (g/dl)	2.27^{a}	2.17^{ab}	2.08^{b}	2.20^{ab}	2.12^{ab}	**0.03**
Creatinine (mg/dl)	0.06	0.05	0.06	0.06	0.06	**0.01**
Cholesterol (mg/dl)	131.23^{b}	135.38^{ab}	136.04^{ab}	140.82^{ab}	147.27^{a}	**2.06**
Urea (mg/dl)	15.97	18.81	18.87	16.28	15.83	**0.50**
AST (i.u/l)	60.09	58.82	57.73	59.33	58.48	**0.76**
ALT (i.u/l)	5.65^{ab}	5.44^{ab}	5.09^{b}	5.29^{ab}	6.24^{a}	**0.15**
ALP (i.u/l)	81.18^{c}	86.59^{a}	85.96^{ab}	83.32^{bc}	86.01^{ab}	**0.50**

Means values with similar superscripts alphabet along the same row are not significantly (P > 0.05) different.
SEM = Standard Error of Mean; AST = Aspartate Aminotransferase; ALT = Alanine Aminotransaminase; ALP = Alkaline Phosphatase

CONCLUSION

It can be concluded from the results in this experiment that;

1. sieved POME which is a major waste from palm oil mill industry and a highly polluting material can be effectively utilised to substitute maize as a good source of nutrient in the diet of turkey when sieved.
2. birds fed sieved POME substituted for maize up to 40% revealed the nutritional quality of POME.

RECOMMENDATION

It was concluded from the results of this experiment that sieved POME can be substituted for maize up to 40% in the diet of turkey without impairing the health of the bird. However, further study on organ histology is recommended.

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