SENSORY EVALUATION AND MEAT CHOLESTEROL OF TURKEY POULT FED VARIED SUBSTITUTION LEVELS OF SIEVED PALM OIL MILL EFFLUENT

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ABSTRACT

The trial evaluates sensory evaluation and meat cholesterol of turkey poult fed varied substitution levels of sieved palm oil mill effluent (POME) for maize. One hundred and fifty (150) day old poults were used for the trials that lasted eight (8) weeks. Sieved POME was used 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. Results showed that, Flavour, tenderness and juiciness were all ($P<0.05$) influenced by the dietary treatments. The values recorded for flavour, tenderness and juiciness increased with increase substitution levels of sieved POME. There were no significant ($P>0.05$) differences in the colour, texture and overall acceptability of breast muscle meat of turkey across the dietary treatment. Meat cholesterol; the values recorded varies significantly ($P<0.05$) across the treatments. However, bird fed 40% has the highest breast meat cholesterol value (67.51mg/100g) while 0% (control) had the lowest value (37.65mg/100g). The highest thigh meat cholesterol value (55.72mg/100g) was recorded from the bird fed 40% while the lowest value (42.69mg/100g) was recorded from the bird fed 0%. It could be concluded that sieved POME can be substituted for maize up to 40% in the diet of turkey without; impairing the health of the bird, reducing meat quality; predisposes the final consumer to heart risks.

KEYWORDS - POME, Turkey poults, Meat, Organoleptic, Cholesterol

INTRODUCTION

Turkey production has not been fully exploited in Nigeria and other developing countries despite its huge potential over other poultry. In order to maximize food production and meet protein requirements in developing countries, multiple options need to be explored and evaluated (Owen *et al*., 2008). Turkey production is an important and highly profitable agricultural industry with a rising global demand for its products (Yakubu *et al*., 2013), and they are adaptable to wide range of climatic conditions (Mohammad *et al*., 2017). Turkey thrives better under arid conditions, tolerates heat better, ranges farther and has higher quality meat (Yakubu *et al*., 2013). Karki (2005) stated that consumption of turkeys and broilers as white meat was rising worldwide and a similar trend also existed in developing countries. Total global production of turkey meat was 5.6 million ton in 2012, which was higher than 5.1 million ton in 2003, a decade earlier (FAOSTAT, 2012). Turkey meat may be a one of the best options for alternative protein source in Nigeria.

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 water. 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 2mm and 4mm mesh for starter and grower phases respectively to remove coarse fibrous materials in it. Five diets were formulated based on the nutritional requirement of turkey (NRC, 1994; Lee, 2014). 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.

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

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

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). Samples from the breast muscle was collected and washed in clean water. The cut parts were packed in a transparent double layer polythene bag and tagged for identification. Thereafter the samples were boiled in water bath at 80^0C for 20 minutes and was allowed to cool under room temperature and served to 10 experienced panellists. Each panellist was

allowed to masticate one sample per treatment with ranked preference in the following categories; colour, juiciness, flavour, texture, tenderness, overall acceptability and meat quality were determined. A nine-point hedonic scale was used, 1 referring to extremely dislike and 9 as extremely like (Cross *et al*., 1975). Data collected were analysed by One-way analysis of variance of a Completely Randomized Design using SPSS for window version 23. Means were compared using Duncan's Multiple Range Test of the same package at P<0.05.

RESULTS AND DISCUSSION

Flavour, tenderness and juiciness were all (P<0.05) influenced by the dietary treatments. The values recorded for flavour, tenderness and juiciness increased with increase substitution levels of sieved POME. There were no significant (P>0.05) differences in the colour, texture and overall acceptability of breast muscle meat of turkey across the dietary treatment. This result corroborates the report of Williams and Damron (1998) and slightly lower than the report of Adeyemo and Sani (2013) for broiler chickens. Sensory analysis allows manufacturers to identify, understand and respond effectively to consumer preferences (Hashim *et al.,* 1995) and also to identify sensory characteristics and consumer preferences help producer in increasing competition for other producers (Tan *et al.,* 2001). However, it had been reported that changing the type and quantity of oil and fat in the diet can change the fatty acid content of fat in the carcass. High concentration of polyunsaturated fatty acids has been associated with values for tenderness, juiciness, flavour and overall acceptability; whereas high concentration of saturated and monounsaturated fatty acids resulted in high overall score (Akinola, 2015).

Table 3: Sensory Evaluation of Turkey Poults Fed Varied Substitution Levels of Sieved POME

	% Levels of POME substituted for maize					
Parameters	**0**	**10**	**20**	**30**	**40**	**SEM**
Colour	5.2	5.5	5.9	6.1	6.3	**0.19**
Flavour	3.1^{b}	3.1^{b}	3.7^{ab}	3.7^{ab}	4.4^{a}	**0.15**
Tenderness	4.1^{b}	4.9^{ab}	5.3^{ab}	5.4^{a}	5.5^{a}	**0.19**
Juiciness	4.0^{b}	4.2^{b}	4.4^{ab}	4.4^{ab}	5.5^{a}	**0.19**
Texture	4.7	5.2	5.4	5.4	5.7	**0.20**
Overall acceptability	6.1	6.2	6.2	6.5	6.6	**0.17**

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

The values recorded varies significantly (P<0.05) across the treatments. However, bird fed 40% has the highest breast meat cholesterol value (67.51mg/100g) while 0% (control) had the lowest value (37.65mg/100g). The highest thigh meat cholesterol value (55.72mg/100g) was recorded from the bird fed 40% while the lowest value (42.69mg/100g) was recorded from the bird fed 0%. The result for breast meat falls within the range 27mg/100g that was earlier reported by Baggio *et al*. (2002) and 53mg/100g by Komprda *et al.,* 2003, except for 40% (67.51) that had higher value. Also, the result for thigh muscle concurs with the result of Paleari *et al*. (1998) (37mg/100g) and Komprda *et al.,* 2003 (62mg/100g). However, the substitution levels of sieved POME had no deleterious effect on the meat cholesterol level and thus there is low or no heart risk when the meat is consumed since the cholesterol levels is within the human tolerant level. According to Helen (1989), hypercholesterolemia (>240mg/dl) is considered a risk factor in coronary heart disease especially when LDL cholesterol in serum is relatively higher compared to HDL cholesterol. In this case, the chance of heart disease is lower.

Table 4: Meat Cholesterol of Turkey Poults Fed Varied Substitution Levels of Sieved POME

	% Levels of POME substituted for maize					
Parameters	**0**	**10**	**20**	**30**	**40**	**SEM**
Breast meat (mg/100g)	37.65^{e}	47.34^{d}	49.67^{c}	53.51^{b}	67.51^{a}	**2.60**
Thigh meat (mg/100g)	42.69^{e}	46.85^{d}	51.34^{c}	53.86^{b}	55.72^{a}	**1.28**

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

CONCLUSION AND RECOMMENDATION

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

1. sieved POME can be effectively utilised to substitute for maize in the diet of turkey without hindering the consumers preference or affecting the meat quality.
2. Progressive Increase in cholesterol values recorded across the treatment could not have deleterious effect on human health.

Sieved POME can be substituted for maize up to 40% in the diet of turkey without; impairing the health of the bird, reducing meat quality; predisposes the final consumer to heart risks.

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