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EFFECT OF DRIED KITCHEN WASTE MEAL AS A PARTIAL REPLACEMENT FOR MAIZE ON BLOOD PROFILE OF BROILER CHICKENS

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ABSTRACT

This study was aimed at investigating the effect of dried kitchen waste meal (DKWM) as a partial replacement for maize on the blood profile of broiler chickens. One hundred and sixty (160) day old broiler chicks were used for the study. After two weeks of brooding, the chicks were randomly assigned to four treatment groups designated T1(0% DKWM), T2(10% DKWM), T3(20% DKWM) and T4 (30% DKWM) with 40 birds each and each treatment was replicated four times with 10 birds per replicate in a Completely Randomized Design (CRD). The study lasted for a period of 6 weeks. The effect of the dietary treatments on the blood profile of the broilers chickens was determined. There were no significant differences (P>0.05) in the hematological parameters and serum biochemical indices measured across the treatment groups. Results from the study showed that DKWM could replace up to 30% of maize in broiler chickens diet without any deleterious effect on their blood characteristics. Therefore, it is safe to have 30% inclusion of dried kitchen waste meal (DKWM) in broiler chickens diet.

Keywords: Blood profiles, Broiler Chickens, Dried Kitchen Waste, Maize,

INTRODUCTION

One of the major constraints to the development of poultry industry in Nigeria is the shortage and high cost of feed due to the high competition between human and livestock on the available food resources. This is as a result of the rapid increase in human population (Adeniji and Oyeleke, 2008). This competition affects the relative availability and affordability of basic feed ingredients used in poultry nutrition (Onifade, 1993). This has also drastically reduced production output in the poultry industry.

A possible way of increasing the supply of poultry products at cheaper prices is by reducing the cost of production through the use of cheaper, locally available energy and protein source feeds. The major conventional energy source in the diets of poultry is maize. Maize is a staple food for man and confectionary industry, which result in the increase in the cost of this product.

Due to the shortage of traditional feeds, non-conventional feeds may be use as alternative feed resources for poultry. Non-conventional feed resources (NCFR) generally refer to all those feeds that have not been traditionally used for feeding livestock and are not commercially used in the production of livestock feeds. They include palm leaf meals, palm press fiber, cassava foliage, spent brewer's grains, sugar cane bagasse, rubber seed meal and some aquatic plants (Chadhokar, 1984).

About 20-30% of food used for human consumption is wasted as food/kitchen waste (Schanes *et al*., 2018). Kitchen/food waste is defined as left-over organic matter from restaurants, hotels and households. Tons of food/kitchen wastes are produced daily in highly populated areas. The portion of leftover food out of total wastes has been continuously increased (Lee and Lee, 1998).

Food/kitchen wastes are nutrient rich surplus materials, which have higher CP and energy value (Westendorf and Myer, 2004). They can be used as regular feeds for poultry (Moon *et al*. 2004). They can be sourced from households, hotel, hostel, restaurants among other sources at zero cost, and fed to poultry after processing. Conversion of food/kitchen waste to animal feed is very crucial because food waste/kitchen waste can contribute not only to decreasing the cost of feed ingredients but also decreasing environmental pollution. Leftover foods are high in moisture content and if not treated well can act as pollutants in water, air and soil when they are uses as landfills (Yang and Jiang, 2005). Dehydrated kitchen waste collected from retirement home in Tokyo were found to contain 15.15% crude protein, 5.33% ether extract, 2.34% crude fibre and 87.76% dry matter (Kojima, 2005). However, Cho *et al*, (2004) reported the chemical composition of dried leftover food (DLF) 93.70% dry matter (DM), 20.62% crude protein, 9.99% crude fat (EE), 8.87% crude fibre (CF), 13.67% ash, 0.41% lysine and 0.18% methionine collected in Korea.

Kojima, (2005) report no negative influence on addition of 25.0% dry kitchen waste on performance of laying hens. However, plasma cholesterol concentrations of broilers fed diets containing dry leftover food slightly increased with the increased level of DLF. Unlike other cholesterol concentrations, HDL concentration of blood from broilers fed diets containing 30% DLF was significantly higher than those fed on control (Cho *et al*., 2001). Information on the utilization of kitchen waste in poultry nutrition is very scanty, even though studies have been done on many non-conventional feed resources in Nigeria. Kitchen/food waste are yet to be studied and exploited. This study is therefore aimed at investigating the effect of dry kitchen waste meal as a partial replacement for maize on hematological and serum biochemical indices of broiler chickens.

MATRIALS AND METHODS

Experimental Site

The study was conducted at the Taraba State University Teaching and Research Farm located between 8.83º North and 11.22º East and on Latitude 11.36' of the equator. It is characterized by a tropical climate. The area is characterized by high temperature throughout the year because of high radiation which is relatively evenly distributed throughout the year. Maximum temperature of about 40ºC has been observed in the area with minimum temperature as low as 18ºC between December and January. Mean annual temperature ranges between 26.9ºC and 27.8ºC (Taraba State Diary 2010).

Experimental Birds and Management

One hundred and sixty (160) day-old unsexed broiler chicks of commercial strain was purchased from a reputable hatchery. The broiler chicks were brooded for a period of two weeks and fed with commercial starter diets before the commencement of the experiment. Water and anti-stress were provided *ad-libitum* during the period.

Collection and Processing of Kitchen Waste

The kitchen/food waste that was used for this study was obtained from households, hotels and restaurants in Jalingo Taraba state, North Eastern Nigeria at zero cost. The waste comprises of leftover food and vegetable and other kitchen waste of plant origin that are not needed by man. Samples with high moisture content were sun dried and milled. Other feed ingredients {Maize, wheat offal, Soybean meal, Groundnut cake, Fish meal, Bone meal, Mineral-vitamin premix, Methionine and NaCl (common salt)} were sourced from Maiduguri, Borno State and Jalingo, Taraba State, Nigeria.

Experimental Diets and Design

Experimental Diets

The experimental diet contained the following ingredients in the order in which they were compounded; Maize, Wheat offal, Soybean meal, Groundnut cake, Fish meal, Bone meal, Mineral-vitamin premix, Methionine and NaCl (common salt) and Dry Kitchen waste meal (DKWM). Four starter and finisher diets were formulated with different levels of the DKWM as shown in Tables 1 and 2 below.

Experimental Design

After two weeks of brooding, the one hundred and sixty (160) broiler chicks were

randomly assigned to 4 treatment groups designated of T1, T2, T3 and T4 with 40 birds each. Each treatment was replicated 4 times with 10 birds per replicate in a Completely Randomized Design (CRD). The study last for a period of 6 weeks.

Table 1: Gross Composition of Diets Containing DKWM for Starter Broilers (%)

Ingredients	**T1 0% DKWM**	**T2 10% DKWM**	**T3 20% DKWM**	**T4 30% DKWM**
Maize	48.0	38.0	28.0	18.0
Dried kitchen waste meal (DKWM)	0.00	10.00	20.00	30.00
Full fat soybean	28.0	28.0	28.0	28.0
Groundnut cake	2.5	2.5	2.5	2.5
Fishmeal	10.0	12.0	14.0	16.0
Wheat offal	7.5	5.5	3.5	1.0
Bone meal	3.0	3.0	3.0	3.0
Lysine	0.2	0.2	0.2	0.2
Methionine	0.3	0.3	0.3	0.3
*Vitamin and minerals premix	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Total	**100**	**100**	**100**	**100**
Calculated nutrient composition				
Metabolizable energy (Kcal/kg)	2,975.50	2,974.94	2,974.07	2,975.46
Crude protein (%)	22.59	22.43	22.27	22.27
Ether extract (%)	8.02	8.22	8.42	8.64
Crude Fibre (%)	3.66	3.69	3.72	3.74
Calcium (%)	0.57	0.56	0.55	0.55
Phosphorus (%)	0.97	0.97	0.97	0.97
Lysine (%)	1.35	1.35	1.35	1.36
Methionine (%)	0.68	0.66	0.65	0.64

DKWM: Dry Kitchen Waste Meal

vitamin premix composition per tone of diet. Vitamin A; 10,000,000 IU, Vitamin D3: 2,000,000 IU, Vitamin E: 40 mg, Vitamin K3: 2 mg, Vitamin B1: 1.5 mg, Vitamin B2: 5 g, Vitamin B6: 2.5 g, Vitamin B12: 20 mg, Niacin: 25 g, Calpan: 9 g, Folic acid: 1 g, Biotin: 100 mg, Anti-oxidant: 100 g, Manganese: 80 g, Iron: 40 g, Zinc: 60 g, Copper: 8 g, Iodine: 1 g, Cobalt: 300 mg

Table 2: Gross Composition of Diets Containing DKWM for Finisher Broilers (%)

Ingredients	**T1 0% DKWM**	**T2 10% DKWM**	**T3 20% DKWM**	**T4 30% DKWM**
Maize	54.4	42.4	30.4	18.4
Dried kitchen waste meal (DKWM)	0.00	10.00	20.00	30.00
Full fat soybean	36.2	38.2	40.2	42.2
Wheat offal	5.6	5.6	5.5	5.5
Bone meal	3.0	3.0	3.0	3.0
Lysine	0.1	0.1	0.1	0.1
Methionine	0.2	0.2	0.2	0.2
*Vitamin and minerals premix	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Total	**100**	**100**	**100**	**100**
Calculated nutrient composition				
Metabolizable energy (Kcal/kg)	3,004.24	3,046.18	3028.11	3,010.05
Crude protein (%)	20.0	19.76	19.54	19.46
Ether extract (%)	8.89	9.32	9.54	10.18
Crude Fibre (%)	3.56	3.73	3.90	4.07
Calcium (%)	0.86	0.87	0.87	0.87
Phosphorus (%)	0.53	0.53	0.52	0.52
Lysine (%)	1.26	1.29	1.31	1.34
Methionine (%)	0.55	0.54	0.53	0.52

DKWM: Dry Kitchen Waste Meal

**vitamin premix composition per tone of diet. Vitamin A; 10,000,000 IU, Vitamin D3: 2,000,000 IU, Vitamin E: 40 mg, Vitamin K3: 2 mg, Vitamin B1: 1.5 mg, Vitamin B2: 5 g, Vitamin B6: 2.5 g, Vitamin B12: 20 mg, Niacin: 25 g, Calpan: 9 g, Folic acid: 1 g, Biotin: 100 mg, Anti-oxidant: 100 g, Manganese: 80 g, Iron: 40 g, Zinc: 60 g, Copper: 8 g, Iodine: 1 g, Cobalt: 300 mg*

Data Collection and Analysis

Blood Collection

At the end of the experiment blood samples were collected from 12 birds; 4 birds were randomly selected from each treatment group for determination of serum biochemical indices. Blood samples were collected from the left wing vein using sterile disposable needle (21-gauge needle) and syringe into heparinized test tubes for haematology and another without EDTA for serum analyses. Before the blood collection, the birds were fasted over night for 12 hours and bled the next morning to avoid excessive bleeding as described by Ogunwole *et al*. (2017). Haematological parameters which include packed cell volume (PCV), haemoglobin (Hb), red blood cells (RBC), white blood cells (WBC) and differential counts were determined using standard procedures as described by Schalm *et al. (*1975). Serum biochemical indices which include; Total protein (TP) and albumin values were determined by Biuret method described by Reinhold, (1953). Globulin was estimated as the difference between total protein and albumin. Cholesterol was determined as described by Roschlan *et al*. (1974). Urea and creatinine were determined by the techniques described byHarrison (2006), serum enzyme (ALT and AST) activities were determined spectrophotometrically as described by (Hoder and Rej, 1983; McComb *et al*., 1983).

Statistical Analysis

Data were analyzed using analysis of variance (Proc ANOVA), and the significant differences among the means were tested using Tukey's test. The SAS software (Version 9.4) was used for these purposes.

RESULTS AND DISCUSSIONS

Table 3 shows the serum biochemical indices of the experimental broiler birds. There were no significant differences (P>0.05) in the serum biochemical indices among the treatment groups. Findings from the present study agrees with Cho *et al*. (2001) who reported non-significant difference (p>0.05) across treatment group of broiler chickens fed dried leftover food. Although contents of total cholesterol, free cholesterol, cholesterol ester and LDL-cholesterol in blood of broilers fed DLF-containing diets appeared to be numerically higher compared with control group. Total serum protein in the present study were similar with the control group. However, Alabi *et al*. (2012) reported a significant (P<0.05) difference in serum biochemical indices with elevated levels of total protein, albumin, globulin, calcium and cholesterol with the increase in inclusion level of indomie noodle waste meal (IWM).

The haematological parameters of experimental birds fed dried kitchen waste meal based diet as a partial replacement for maize are shown in Table 4. There were no significant differences (P>0.05) in the haematological parameters measured across the treatments groups. This result contrast the findings of Alabi *et al*. (2012) who reported significant (P<0.05) decrease in Hb, PCV and the erythrocyte indices with increased inclusion level of indomie noodle waste meal (IWM) in finisher broiler chickens. However, values of most of the haematological parameters measured in the present study are within the normal ranges for broiler chickens. The mean white blood cells value of birds with 30% inclusion level of DKWM was numerically lower than the control group (0% DKWM) although the difference is not up statistically significant.

Table 3: Means±SE Serum Biochemical Indices of Broilers Fed DKWM as a Partial Replacement for Maize in Broilers Finisher Rations

	Treatments			
Parameters	**T1,(0% DKWM)**	**T2,(10% DKWM)**	**T3,(20% DKWM)**	**T4,(30% DKWM)**
Aspartate Amino Transferase (iu/l)	76.60±6.30	77.20±1.96	72.60±4.72	79.73±6.18
Alanine Amino Transferase (iu/l)	7.86±2.31	11.33±1.55	10.46±1.26	9.83±1.49
Alkaline Phosphate (iu/l)	86.00±4.61	81.66±1.45	88.20±1.10	87.93±4.24
Total Protein (g/l)	42.83±0.16	42.43±1.29	42.96±1.39	40.70±0.86
Albumin (g/l)	20.93±0.24	20.76±1.62	19.76±0.21	21.46±1.32
Total bilirubin (mmol/l)	6.16±0.12	6.13±0.28	5.33±0.53	5.46±0.54
Conjugate Bilirubin (mmol/l)	1.16±0.08	1.13±0.13	1.46±0.06	1.36±0.18
Calcium (mmol/l)	2.11±0.04	2.00±0.15	1.93±0.12	2.23±0.03
Sodium (mmol/l)	137.66±2.02	137.00±4.04	131.06±0.74	134.26±1.89
Chloride (mmol/l)	105.33±0.66	105.66±1.20	103.33±2.02	104.00±0.57
Potassium (mmol/l)	5.53±0.26	6.10±0.60	5.20±0.17	5.96±0.08
Glucose (mmol/l)	7.40±0.32	8.16±0.12	8.46±0.31	8.50±0.56
Cholesterol (mmol/l)	1.83±0.14	2.30±0.37	3.03±0.23	2.43±0.29
Bicarbonate (mmol/l)	32.33±2.60	30.00±4.04	27.73±1.57	30.26±2.45
Urea (mmol/l)	1.80±0.17	1.80±0.10	1.83±0.08	2.16±0.08
Creatinine (mmol/l)	112.66±2.19	111.33±3.52	112.33±4.63	114.33±2.72

Means in each row without superscripts are not significantly (P>0.05) different
DKWM= Dry Kitchen Waste Meal

Table 4: Means±SE of Hematological Parameters of Broilers Fed DKWM as a Partial Replacement for Maize in Broilers Finisher Rations

	Treatments			
Parameters	**T1,(0% DKWM)**	**T2,(10% DKWM)**	**T3,(20% DKWM)**	**T4,(30% DKWM)**
PCV (%)	23.333±2.72	25.667±1.86	20.667±0.67	24.000±1.00
RBC (x 10^{-6}/ml)	2.1667±0.15	2.2000±0.15	1.7667±0.03	1.9000±0.06
WBC (x10^{2}/µl)	5.670±1.56	4.743±0.28	5.393±0.55	4.633± 0.14
MCV (FI)	110.33±8.25	124.10±7.95	117.37±6.02	126.82±8.96
MCH (pg)	52.267±2.73	57.367±0.69	56.367±4.21	63.433±4.92
MCHC (g/dl)	41.367±4.41	49.253±0.75	48.000±1.16	49.487±0.51
Platelets (x10^{-6}/mm)	33.667±1.20	38.333±0.08	34.667±2.10	35.667±0.88
Hemoglobin (g/dl)	11.400±1.39	12.633±0.88	9.933±0.55	11.867±0.37
Heterophil (%)	17.000±2.08	18.000±0.58	21.000±3.79	21.333±1.45
Lymphocyte (%)	80.333±0.88	75.667±1.20	75.333±4.07	71.667±2.33
Monocytes (%)	2.000±1.16	4.333±0.88	3.667±0.88	5.667±0.88
Basophil (%)	0±0.00	0±0.00	0±0.00	0±0.00
Eosinophil (%)	0.667±0.67	2.000±1.00	0.667±0.67	1.667±1.20

Means in each row without superscripts are not significantly (P>0.05) different.
DKW: Dried kitchen waste, PCV: Packed cell volume, RBC: Red blood cell, MCV: Mean corpuscular volume, MCH: Mean corpuscular haemoglobin, MCHC: Mean corpuscular haemoglobin concentration, WBC: White blood cell, Pg: pictogram, Fl: Femto litre, g/dl:Gram per deciliter

CONCLUSION

Results from the present study showed that dried kitchen waste meal (DKWM) could replace up to 30% of maize in broiler chickens diet without any deleterious effect on their blood characteristics and thus recommended. Further study is hereby recommended to ascertain the effect of higher inclusion level on the performance of broiler and other classes chickens.

REFERENCES

Adeniji, A.A. and Oyeleke MM (2008). Effects of dietary grit fed on the utilization of Rumen content by pullet chicks. J Appl Sci Res 4:1257

Alabi, O.M., Aderemi,F.A., Ladokun,A.O., Lawal, T.E., Alabi, O.B.and Afolabi, K.D.(2012).Blood profile of broiler finishers fed diet with graded levels of indomie noodle waste meal in humid tropics.Elixir Agriculture 52: 11269-11272

Chadhokar, P.A. (1984). Non-conventional feed resources for livestock in soil and water conservation program. Community Forestry and Soil Conservation Development Department, Ministry of Agric. FAO. Adis-Ababa, Ethiopia

Cho, Y. M., Lee, G. W., Jang, J. S., Shin, I. S., Myung, K. H., Choi, K. S., … Yang, C. J. (2001). Effects of Feeding Dried Leftover Food on Growth and Body Composition of Broiler Chicks, 386–393.

Harrison K. E.(2006) Diagnostic value of biochemistry. In: Harrison GJ, Lightfoot TL, editors, Clinical Avian Medicine. 2006;2.

Hoder M. and Rej R.(1983). Alanine transaminase. In: Methods of enzymatic analysis. 3rd ed. H. Bergmeyer U, Bergmeyer I, Grassl M, (eds). Weinhen Velag-Chemie;

Kojima, S. (2005). Dehydrated Kitchen Waste as a Feedstuff for Laying Hens, *International Journal of Poultry Science 4*(9), 689–694.

Lee, K. H. and S. K. Lee. (1998). Biological feed value of dried food waste meals for poultry. Kor. J. Anim. Nutr. Feed. 22(2):95-102.

McComb RB, Bowers GN and Rosen S.(1983). Alkaline phosphate. Plenum Press, New York;

Moon, J. S., I. K. Kwon and B. J. Chae. (2004). Effects of feeding of diets with or without food waste on growth performance and carcass characteristics in finishing pigs. Asian-Aust. J. Anim.Sci. 17:504-510.

Ogunwole, Olugbenga & Abu, Okhiomah & Adedeji, Bamidele & Jemiseye, F. & Ojelade, Ayp & Tewe, O. (2017). Haematology and Serum Indices of Finisher Broiler Chickens Fed Acidified Blood Meal-based Diets. Journal of Advances in Biology & Biotechnology. 11. 1-7. 10.97

Onifade, A.A. (1993). Comparative utilization of three dietary fibre sources of broiler chickens. PhD Thesis submitted to the Department of Animal Science, University of Ibadan, Nigeria pp 186

Reinhold JG (1953). Standard methods of clinical chemistry. Edited by Reiner, M. Academic Press, New York.;1:88.

Roschlan P, Bernet E, Gruber W.(1974). Ezymatische best immungoles gesamt Cholesterius in serum. J. of Clin. Chem. and Biochem.;12:403-407.

SAS (2000). SAS/STAT User's Guide: Statistics. Version 6. For Windows. SAS Institute Inc. Cary, N.C. USA.

Schanes, K., Dobernig, K., & Gözet, B. (2018). Food waste matters - A systematic review of household food waste practices and their policy implications. Journal of Cleaner Production, 182, 978-991.

Schalm OW, Jain NC, Caroll EJ (1975). Veternity haematology. 3rd Edn., Lea and Fabiger, Philadelphia.;15-218.

Westendorf M L and Myer R O.(2004). Feeding food wastes to swine. In Florida cooperative extensive service press. Institute of food and agricultural sciences, University of Florida

Yang, N., and Jiang, R. S. (2005). Recent advances in breeding for quality chickens. World Poult. Sci. J., 61: 373-381.