HAEMATOLOGICAL AND BIOCHEMICAL PARAMETERS OF BROILER FINISHER FED GRADED LEVELS OF MAGGOT MEAL

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Abstract
A 56-day study was carried out to determine the haematological and biochemical characteristics of one hundred and twenty (120) broilers finisher fed varying levels of maggot meal (MM). The experiment was carried out in a completely randomized design (CRD) in which the birds were randomly grouped into four treatments and further replicated three times with ten birds per replicate. Four finisher broiler diets were compounded, incorporating (MM) at 0%, 50%, 75% and 100% respectively. The diets were designated T_1, T_2, T_3 and T_4, respectively, T_1 served as the control (with no MM). The birds were given feed and water ad-libtum and were subjected to similar sanitary and husbandry conditions throughout the experimental period. Data were collected for haematological and biochemical analysis. Statistics result revealed that only red blood cell (RBC), mean corpuscular haemoglobin concentration (MCHC), albumin, urea, aspartate aminotransferase (AST) and creatinine showed significant ($P<0.05$) differences, while others showed non-significant ($P>0.05$) differences. Result indicates that maggot meal can completely replace fish meal as a protein source as the birds are physiologically stable.

Keywords*:* Haematological, Biochemical, Maggot Meal and Broilers

Introduction

Nigeria is abundantly blessed with different varieties of animal protein sources yet there is the challenge of insufficient production and supply of animal protein to the fact that daily consumption is less than 10g against minimum requirement. FAO (2006) gave a daily protein requirement of an average adult as 65g/caput/day, of which 35g is expected to be of animal origin. Egbewande (2010) reported that in Nigeria, the available protein is given at 45g/caput/day with animal protein accounting for 8g/caput/day, representing a short fall of about 77% in animal protein recommended by FAO (2006). To bridge the gap, poultry production in general and broiler particularly is a sure way. Broilers have a fast growth rate, better feed conversion ratio; rapid return on investment, the meat contains more protein and essential amino acids than other meats and low in cholesterol content. Feeding alone accounts for 60-70% of the total production cost in modern poultry production systems (Wilson and Beyer, 2000).Conventional energy and protein sources used are heavily competed for, by other livestock, humans, and industries thereby leading to their high prices and minimal returns. Competition for conventional protein sources has prompted researchers to embark on research for alternatives like MM that are cheaply available and comparable to FM. The crude protein content of maggots is high (39-63%) (Aniebo and Owen, 2010) and akin to that of fish meal (Veldkamp *et al*., 2012). Both haematological and biochemical analyses of blood is of great importance in assessing the nutritional effect of feedstuffs on the animals. They serve as diagnostic tools and physiological indicators in birds has been documented (Harr, 2002; Hauptmanova *et al*., 2006). However, these parameters are greatly affected by sex, age and season (Fudge, 2000; Kececi and Col, 2011).This study, therefore, was designed to investigate the haematology and biochemical characteristics of broiler finisher fed different levels of maggot meal.

Materials and Methods

The research was carried out at the poultry project site of the Federal College of Agriculture, Ishiagu Ebonyi State. The maggot used for this experiment was cultured from fresh chicken manure. After about 5 days, larvas of maggots were produced. They were harvested, oven dried at 55^0C for one day and were grinded into maggot meal and were incorporated at different inclusion levels in the diets of broilers. One hundred and twenty (120) day old chicks were used for the experiment. They were randomly allocated into four treatment diets with thirty birds each and were replicated three times with 10 birds per replicate in a Completely Randomized Design (CRD). Four levels of diets were formulated 0%, 50%, 75% and 100% representing T_1, T_2, T_3 and T_4 respectively.

Blood Collection for Hematological and Biochemical Analysis.

At the end of the feeding trial, about 5mls of blood sample was collected for the analysis. The blood samples were taken from the wing vein of the bird using disposable needle and syringe. Blood samples were collected from two (2) birds per replicate ie six birds per treatment. For haematological analysis, about 2mls used for analysis was stored in a bottle containing anticoagulant, ethylene diamine tetra acetic acid (EDTA) to prevent clotting and subsequently analyzed to determine RBC, white blood cell(WBC), packed cell volume(PCV), haemoglobin(Hb), mean corpuscular volume(MCV) and MCHC. For serum biochemical analysis, about 3mls was used. It was store without anticoagulant, after coagulation it was separated and the harvested sera were used to determine the following parameters urea, total protein, albumin, AST, alanine aminotransferase (ALT) and creatinine.

Data Collection and Analysis

Data collected for haematological and biochemical parameters were analyzed using analysis of variance (ANOVA) as described by Steel and Torrie (1980) and differences among means were separated using least significant differences (LSD).

Statistical Model

The statistical model for CRD is shown below

Yij = μ□ + ti + eij□

μ□ = overall mean effect

ti = true effect of the ith treatment

eij = error term of the jth unit receiving ith treatment

Table 1: Composition of Experimental Diet

Ingredients	T_1 (0%)	T_2 (50%)	T_3 (75%)	T_4 (100%)
Maize	60.40	60.40	60.40	60.40
Maize offal	13.00	13.00	13.00	13.00
Fish meal	6.00	3.00	1.50	0.00
Maggot Meal	0.00	3.00	4.50	6.00
Blood meal	2.00	2.00	2.00	2.00
Soya bean meal	16.30	16.30	16.30	16.30
Bone meal	1.00	1.00	1.00	1.00
Limestone	0.30	0.30	0.30	0.30
Lysine	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Vit/min premix	0.25	0.25	0.25	0.25
Total	100	100	100	100

Results and Discussion

Table 2: Haematological Parameters of Broiler Finisher Fed Different Levels of Maggot Meal

Parameters	T_1 (0%)	T_2 (50%)	T_3 (75%)	T_4 (100%)	SEM
Hb (g/dl)	8.16	7.80	10.77	11.50	9.17
PCV (%)	24.50	23.40	32.33	34.50	6.92
WBC ($x10^3$mm)	6.93	7.27	7.87	6.67	0.69
RBC ($x10^6$μl)	3.20^a	3.20^a	2.90^c	3.10^b	0.32
MCV (fl)	76.67	72.00	111.33	111.00	27.10
MCHC (g/dl)	32.90^b	33.10^a	32.70^{cd}	32.83^c	0.61

Table 2 showed the haematological characteristics of broiler finisher fed different levels of maggot meal. MCHC and RBC showed significant differences ($p<0.05$), while Hb, PVC, WBC and MCV showed non-significant differences ($p>0.05$). The effect of diet on haematological parameters of broilers as reported in Table 2 showed that treatment groups had significantly higher values at 75% and 100% inclusion of maggot meal for Hb, PCV and MCV. Furthermore, the RBC result showed that

birds fed control diet (T_1) and 50% (T_2) had significantly ($p<0.05$) higher values than others. MCHC result showed that birds on 50% (T_2) had significantly ($p<0.05$) higher values when compared to other treatments. Furthermore, all the values obtained for the haematological parameters in this study were within their normal range (Bounous and Stedman 2000) except for WBC values that falls slightly below the normal range (12-30 x 10^3µl). The WBC values reported is at variance with that (53.25-56.00 10^3L) of Mahmud *et al.* (2016).

Table 3: Biochemical Characteristics of Broiler Finisher Fed Different Levels of Maggot Meal

Parameters	T_1 (0%)	T_2 (50%)	T_3 (75%)	T_4 (100%)	SEM
Total protein (mg/dl)	3.73	2.80	3.40	3.13	0.52
Albumin (mg/dl)	1.57^a	1.30^c	1.43^b	1.43^b	0.16
AST (Iu/l)	297.00^a	286.00^b	275.67^c	211.67^d	75.35
ALT (Iu/l)	47.00	24.33	16.67	20.33	18.08
Urea (mg/l)	2.90^a	2.57^c	2.03^{cd}	2.80^b	3.68
Creatinine (mg/dl)	1.03^c	1.07^b	1.07^b	1.13^a	0.30

Table 3 showed the biochemical characteristics of broiler finisher fed different levels of maggot meal. Albumin, AST, urea and creatinine showed significant differences ($p<0.05$), while other parameters total protein, globulin and ALT showed non-significant differences ($p>0.05$). Albumin, AST and urea results showed that birds on control diet T_1hadhighly significant values ($p<0.05$) than others. The highest value (3.73g/dl) of total serum protein was observed in T_1 (0%) inclusion of MM, while the least value (2.80g/dl) was obtained in T2 (50%) inclusion. Serum protein values fluctuate across the treatments. Albumin, AST and urea values differed significantly ($P<0.05$) higher among the treatments. Albumin, AST and urea highest values (1.57g/dl, 297.00 Iµ/l and 2.90 mg/l) observed in T_1 (0%) inclusion of MM while the least values were obtained in T_2, T_4 and T_3 respectively. Creatinine differed significantly higher ($P<0.05$) among treatment groups. Furthermore, the highest value (1.13mg/dl) was observed in T_4 (100%) inclusion of MM, while T_1 (0%/ control diet) had the least value. The result followed an increasing trend as the level of MM increases. The result agrees with the findings of Ayorinde *et al.* (2017) that reported (0.89-1.56 mg/dl). Values of both haematological and biochemical parameters obtained in this study were within the normal range. Graded levels of maggot meal did not have deleterious effect on the health of the birds. Maggot meal can completely replace fish meal as the physiological profiles of the birds are stable.

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