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HEAMATOLOGICAL AND BIOCHEMICAL INDICES OF MEAT-AND EGG-TYPE CHICKENS FED MAGGOT MEAL

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Target Audience: Nutritionist, feedmillers, animal products consumers, livestock farmers and researcher.

ABSTRACT

Two experiments were conducted to assess the effect of maggot meal on the biochemical and haematological indices of meat-and egg-type chickens. The meat type chickens were fed the experimental diet for 7 weeks and blood samples collected at a week interval starting from the 4th week. The egg type chicken experiment lasted for 12 weeks and blood samples were collected at 3weeks interval. All samples were analysed for biochemical indices on replicate bases. In both the meat- and egg type chickens experiments maggot meal replaced fish meal at grade levels of 0,25,50,75 and 100 percent. The results generally did not indicate significant effect ($p>0.05$) for all biochemical indices considered but for cholesterol. The cholesterol value was significantly influenced ($p<0.05$) by the use of maggot meal leading to a reduction in cholesterol level with increased inclusion of both meat-and egg-type chicken. Similarly egg yolk qualities of the egg type chickens also showed reduction in cholesterol and calcium levels with increased inclusion of maggot meal as replacement for fish meal. This reduction in cholesterol levels is of dietetic and health importance, as it is suggestive of a panacea to coronary diseases associated with hypercholestereamea.

Key words: maggot meal, fish meal, meat-and egg- type chickens, biochemical indices

DESCRIPTION OF PROBLEMS

The short fall in animal protein supply in Nigeria is abundantly evident in the nutrition of the greater proportion of the citizens. Efforts are being geared towards increasing the animal protein supply by increasing livestock production which often met with scarcity of conventional ingredients and high cost of finished feed. Nutritionist have therefore explored many Agro-by-products and tried to recover nutrients from waste for the purpose of making ingredients from unconventional feed resource (1,2,3). In addition, it also aimed at reducing the cost of finished feed. The various efforts at finding alternatives to fish meal have not been easy owing to the high nutritive quality of the fish meal, (4). However, some close performance efficiencies have being reported with maggot meal processed from

maggot grown on enriched poultry droppings (5,6).

In spite of the relative successes achieved with the use of various unconventional feed ingredients based on the relative performances of the experimental animals much is still to be investigated on the micro effects of these ingredient. This study therefore investigate the biochemical effect on maggot meal in the diets of meat-and egg-type chickens as a way of assessing its micro effects on the chickens.

MATERIALS AND METHODS

The maggot meal was produced as described by (5). The maggot meal contained 54% crude protein, was to replace fish meal (65% CP) at 4.5 and 3.0% respectively in the dietary compositions of broilers(12 MJ/kg, 20/kg CP) and laying pullets (0,25,50,75 and 100% replacement).Dietary replacement was based on equi-protein bases. The meat-type chicken (150)were purchased at day old and assigned to the five dietary treatments (replacement levels)in three replicates. They were fed for 7 weeks but blood samples were collected for four times at week 4,5,6 and 7 from two birds per replicate . Bleeding was through the jugular vein puncture and blood samples were used for haematological and biochemical analyses.

A total of 180 laying pullets were fed the experimental diets for 12 weeks . Blood samples were collected on replicate bases weekly for the last 4weeks. The egg yolk from these birds were also analysed for some haematological and biochemical indices. All blood samples for haematological indices were collected into bottle pretreated with EDTA. The haematological indices include packed cell volume (PCV), haemoglobin concentration (Hb), white blood cell count (WBC), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) mean corpuscular haemoglobin concentration (MCHC).

The samples for biochemical indices (total protein, globulin, albumin, urea and cholesterol) were collected into samples bottles and allowed to coagulate, and decanted after centrifugition. The serum was then used for analyses according to Ferro-Ham method as described by Coles (7). Enzymes assays for Aspartate and Alanine aminotransferases (AST and ALT respectively) were analysed according to Reitman and Frankei (8). All data collected were subjected to analysis of variance and significant means separated by Duncan multiple Range (9). Table 1 shows the dietary composition of the control diets for the meat- and egg- types chickens.

RESULTS AND DISCUSSIONS

The results of the haemological and biochemical indices of the meat and egg type chickens fed the graded levels of maggot meal as replacement for fish meal are shown in Tables 2 and 3 respectively.

Table 1: Compositions of experimental control diets for meat-and egg-type chicken(%)

Ingredients	1	2
Maize	56.00	43.30
full fat soyabean	24.00	18.00
fish meal	4.50	3.00
maggot meal	-	-
Blood meal	3.00	
maize offal	5.20	14.50
bone meal	3.50	3.00
oyster shell	1.50	7.50
premixx	1.00	0.25
salt	1.00	0.30
methionine	0.30	0.15
Determined analysis		
Crude protein	20.30	17.03
Crude fibre	4.05	6.50
Exther extract	6.60	3.80
Ash	4.50	6.35
Calculated metabolizable energy (MJ/kg)	12.00	10.98

Premix- Agricare products

1. Broiler finisher diet 2. Layer diet

Table 2: Heamatological and Biochemical indices of broiler chickens fed diet containing graded levels of maggot meal as replacement for fish meal

	Treatment					
Characteristics	1	2	3	4	5	SEM
PVC(%)	36.00	33.50	34.00	36.550	36.50	1.40
Hb(%)	9.66	9.14	9.82	9.97	9.96	0.30
RBC(10^6/mm^3)	22.62	2.822	2.36	2.66	2.44	0.74
WBC(10^3/mm^3)	25.28	25.95	25.45	25.25	25.03	11.19
MCV(fl)	130.39	120.05	145.01	136.36	145.66	8.40
MCH(pg)	35.84	34.49	40.05	37.75	39.05	1.84
MCHC(%)	26.89	27.29	29.02	27.32	26.48	0.78
Total protein (g/dl)	5.30	5.30	5.25	5.13	5.10	0.13
Albumin (g/dl)	2.03	2.10	2.13	22.00	2.11	0.06
Globulin (g/dl)	3.28	3.115	3.12	3.13	2.99	0.09
Glucose(mg/dl)	194.23	196.00	192.88	195.95	192.63	2.338
Urea(mg/dl)	12.78	13.08	12.98	12.72	12.83	0.19
Cholesterol(mg/dl)	94.00[a]	93.50[a]	91.50[ab]	90.00[b]	89.00[b]	0.84
AST(iu/dl)	136.50	139.00	131.50	135.50	130.50	1.73
ALT(iu/dl)	26.00	27.00	24.00	25.50	25.50	1.50

a,b means with different superscript within a row are significantly different ($p<0.05$)

AST – Aspartate aminotranferase.

ALT – Alanine aminotranferase

Replacement level (%) of treatments

1-OMM:IOOFFM; 2-25MM : 75FM;3-50MM:50FM;
4-75MM:25FM ;5-100MM:0FM

MM-maggot meal; FM-fish meal.

The haematological indices in both the meat type (Table 2) and egg type (Table3) chickens were not influenced by the replacement levels of maggot meal for fish meal. The biochemical indices assessed also followed similar pattern except for cholesterol . The sera cholesterol levels of both meat and egg type chickens were significantly (<0.05) reduced with increased inclusion levels of maggot meal in the diet. Also, in table 3, the biochemical characteristics of the egg yolk analysed indicated significant (<0.05) reduction in egg yolk cholesterol and calcium concentration with increased inclusion of maggot meal in the diets ,a trend that was similar to that of the sera cholesterol level. Other parameters were not statistically ($p>0.05$) affected.

Table 3: Haematological, biochemical indices of egg yolk biochemicals of egg type chickens fed diet containing graded level of maggot meal as replacement for fish meal

	Treatment.					
Characteristics	1	2	3	4	5	SEM
PVC(%)	37.05	34.50	335.00	36.45	36.50	1.45
HB(%)	10.60	10.45	10.96	10.55	10.10	0.25
RBC(10^6/mm^3)	2.85	2.92	2.70	2.80	2.65	0.43
WBC(10^3/mm^3)	25.28	25.25	24.45	24.53	24.95	0.91
MCV(fl)	130.45	114.05	135.50	132.63	140.00	4.40
MCH(Pg)	36.05	34.00	38.72	36.75	38.45	1.80
MCHC(%)	25.80	26.20	28.02	25.65	25.96	0.80
Total protein (g/dl)	4.80	4.82	4.65	4.60	4.60	0.12
Albumin (g/dl)	2.00	2.10	2.00	2.02	2.10	0.05
Globulin(g/dl)	2.80	2.72	2.65	2.58	2.50	0.07
Glucose (mg/dl)	184.02	186.00	179.80	182.55	182.35	2.34
Urea (mg/dl)	12.80	12.95	12.88	12.62	12.81	0.20
Cholesterol(mg/dl)	65.00^{ab}	64.50^{a}	62.45^{ab}	61.02^{b}	61.00^{b}	0.84
AST(iu/dl)	130.00	133.50	128.50	130.00	128.04	1.75
ALT(iu/dl)	24.00	25.00	22.00	23.50	23.00	1.07
Egg yolk Qualities:						
Cholesterol(mg/dl)	13.52^{a}	12.55^{b}	12.49^{b}	12.44^{b}	12.29^{b}	0.12
Triglyceride (mg/dl)	39.65	39.40	38.80	38.50	38.27	0.32
Calcium(mg/g)	0.45^{a}	0.42^{a}	0.36^{b}	0.35^{b}	0.32^{b}	0.04
Phosphorus(mg/g)	0.25	0.25	0.24	0.26	0.25	0.02

a,b means with different superscript within a row are significantly different ($p<.0.05$). see Table 2 for replacement levels and abbreviations.

The non significant effect of maggot meal on the haematological and most of the , biochemical indices are indicative of the high nutritive quality of the fish meal as animal protein alternative to fish meal. This findings tend to boost the earlier reports of similar performance characteristics when maggot meal replaced fish meal in chickens diet (6,10).It thus implied that at both macro and micro levels maggot meal has no deleterious nutritive effects on chickens whether of the meat or egg type .The reduction in the serum cholesterol levels and egg

yolk cholesterol concentration appears to be an important revelation . Cholesterol has been largely associated with hypercholesterimea and other coronary diseases. The significant reduction of this serological index and egg yolk characteristics is a suggestive panacea to the cholesterol problems associated with the consumption of eggs and meat.

The observed reduction in cholesterol concentration is attributable to the inability of insect to synthesize cholesterol on their own (11) . The implication is that maggot being insect may have led to a reduction in the cholestrol content of the diet contributed by ingredients its inclusion in the diet. Therefore, the higher the maggot meal inclusion to replace fish meal in the chicken diets, the lower the cholesterol translation from the ingredients into the components of the experimental animals.

Furthermore, the non significant observation in the enzymes assays and the white blood counts alleys the possible fears of imminent hazard source (bacteria contamination.) that may be associated with the use of maggot meal.

On the other hand the reduction in egg yolk calcium concentration which is also associated with the level of inclusion of maggot meal agrees with the earlier reports of Oladeji (12) that maggot are low in calcium content . Therefore the lowered egg yolk calcium concentration suggest the need to boost the calcium sources when maggot-meal is used to replace fish meal in the of laying birds This will be necessary to avoid deficiency when total calcium supply is below recommended value as this could result in soft shell formation and increase incidence of cracks.

CONCLUSIONS AND APPLICATIONS

(1) This study shows that maggot meal does not affect the haematological and most of the biochemical indices , therefore it stands a good animal protein source for poultry birds.

(2) The reduced cholesterol concentration in blood of meat type chickens and in both blood and egg yolk of egg type –chickens is of nutritional and health importance. Maggot meal as animal protein source for poultry birds may be the panacea to coronary diseases patients.

(3) Maggot meal can be incorporated at 4.5% of the dietary composition of broiler finisher and laying pullets without any harmful micro effect.

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