

## Haematological Responses and Serum Biochemistry of Broiler Chicken Fed Graded Levels of Enzyme (Maxigrain) Supplemented Cassava Peel Meal (CPM) Based Diets

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**Abstract:** Eight weeks feeding trial was conducted to investigate the effect of graded levels of enzyme supplemented cassava peel meal (CPM) on the haematology and serum biochemistry of broiler chicken. Five experimental diets were formulated in which CPM replaced maize at 0, 25, 75 and 100% in both starter and finisher rations. One hundred and twenty (120) broiler chicks were randomly allotted to five dietary treatments with three (3) replicates of eight (8) birds per replicates in a completely randomized design. Result of haematology and serum biochemistry parameters showed significant differences ( $P < 0.05$ ) among treatments indicating that test diets influence the values of the parameters. However, albumin values did not significantly differ among treatments. This shows that the test diets did not depress the fighting ability of the body system of the birds. Fifty percent (50%) level of inclusion however, gave normal range. It is therefore recommended that CPM can be included up to 50% in the diet of broilers without deleterious effect.

**Key words:** Broiler · Haematology · Serum · Biochemistry · Enzyme · Cassava peel

### INTRODUCTION

The use of unconventional feed stuffs is gaining more recognition in the field of animal nutrition. This is basically due to the high cost of conventional feeds which is a contributory factor resulting to high cost of livestock production in Nigeria. Cassava peels in Nigeria are always discarded as waste and are usually allowed to rot hence resulting to a waste disposal problem. This at present is posing a problem of health hazard to humans [1]. These peels are potential feed resources for animals if properly harnessed by a biotechnological process. Cassava peels contains toxic levels of cyanogenic glucoside which is the major limitation to the use of cassava products and its by-products.

Enzyme supplementation may be useful in reducing the toxic components of cassava peel. There is however, little information on enzyme supplementation of cassava peel meal being incorporated in poultry feeds and its effects on the haematology and serum biochemistry of broiler chicken. This research therefore attempted to study the effects of enzyme supplemented cassava peel

meal on the haematology and serum-biochemistry of broiler chicken. Balogun and Fetuga [2] suggested that nutritional studies should not only be limited to carcass quality and nitrogen utilization in broiler chickens, but also should include its blood constituent, because it can be used to monitor flock health and to identify nutritional approaches to the improvement of animal production.

### MATERIALS AND METHODS

**Location of study area:** The research was conducted in the Federal University of Technology Yola Teaching and Research farm located in Yola Adamawa state Nigeria. It is within latitude  $9.11^\circ$  north and longitude  $12.28^\circ$  east. It has minimum and maximum rainfalls of 750 and 1050mm and an average minimum temperature of  $15^\circ$  and maximum of  $32^\circ\text{C}$  [3].

**Experimental Diets and Treatment:** Five experimental diets were formulated for both starter and finisher phases. Diet one (T1) had zero replacement of cassava peel meal and served as the control diet, while diets two to five

Table 1: Composition of starter diets (kg/100kg)

Ingredients	T1 0% CPM	T2 25% CPM	T350% CPM	T4 75% CPM	T5 100%
Cassava peel	00.00	12.00	24.00	36.00	48.00
Maize	48.00	36.00	24.00	12.00	00.00
Groundnuts cake	31.70	31.70	32.70	32.70	32.70
Wheat offal	13.00	12.00	11.00	9.00	8.00
Fish meal	3.00	4.00	5.00	6.00	7.00
Bome meal	2.50	2.50	2.50	2.50	2.50
Limestone	1.00	1.00	1.00	1.00	1.00
Salt	0.25	0.25	0.25	0.25	0.25
Premix*	0.25	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10	0.10
Methionine	0.20	0.20	0.20	0.20	0.20
Enzyme	00.00	++	++	++	++
Total	100.00	100.00	100.00	100.00	100.00
Cal. Analysis Crude protein%	23.23	23.01	23.24	22.85	22.64
M/E (kcal/kg)	2814.01	2657.66	2526.68	2351.20	2194.42
Crude fibre	5.99	7.99	10.44	11.78	13.17

+ Supreme vitamin-mineral premix contains per 2.5kg the following: Vitamin A, 15,000,000 i.u; vitamin D3, 3,000,000 i.u, vitamin E,30,000 i.u, vitamin K, 2,500 mgr; Thiamine, B1, 2,000 mgr; Riboflavin, B2, 6,000 mgr; Pyridoxine B6, 4,000 mg; Niacin, 40,000 mgr; vitamin B12, 20mgr; Pantothenic Acid, 10,000 mgr; Folic Acid, 1,000mgr; Biotin, 80mgr; Choline Chloride 500mgr; Antioxidant, 125gr; Manganese 96gr; Zinc, 60gr; Iron, 24gr; Copper, 6gr, Iodine, 1.4gr; Selenium, 240mgr and Cobalt, 120gr.

++ Maxigrain enzyme at 100g per one tone of feed.

Table 2: Composition of finisher diet (kg/100kg)

Ingredients	T1 0% CPM	T2 25% CPM	T350% CPM	T4 75% CPM	T5100%CPM
Cassava peel	00.00	13.50	27.00	40.50	54.00
Maize	54.00	40.50	27.00	13.50	00.00
Groundnuts cake	24.00	24.60	25.00	26.00	26.00
Wheat offal	15.60	14.00	12.60	10.60	9.00
Fish meal	2.00	3.00	4.00	5.00	6.60
Bome meal	2.50	2.50	2.50	2.50	2.50
Limestone	1.00	1.00	1.00	1.00	1.00
Salt	0.25	0.25	0.25	0.25	0.25
Premix*	0.25	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10	0.10
Methionine	0.20	0.20	0.20	0.20	0.20
Enzyme	00.00	++	++	++	++
Total	100.00	100.00	100.00	100.00	100.00
Cal. Analysis Crude protein%	20.15	20.20	20.27	19.80	19.78
M/E (kcal/kg)	2836.88	2663.63	2489.16	2319.30	2147.47
Crude fibre	5.41	7.60	9.78	11.99	14.70

+ Supreme vitamin-mineral premix contains per 2.5kg the following: Vitamin A, 15,000,000 i.u; vitamin D3, 3,000,000 i.u, vitamin E,30,000 i.u, vitamin K, 2,500 mgr; Thiamine, B1, 2,000 mgr; Riboflavin, B2, 6,000 mgr; Pyridoxine B6, 4,000 mg; Niacin, 40,000 mgr; vitamin B12, 20mgr; Pantothenic Acid, 10,000 mgr; Folic Acid, 1,000mgr; Biotin, 80mgr; Choline Chloride 500mgr; Antioxidant, 125gr; Manganese 96gr; Zinc, 60gr; Iron, 24gr; Copper, 6gr, Iodine, 1.4gr; Selenium, 240mgr and Cobalt, 120gr.

++ Maxigrain enzyme at 100g per one tone of feed.

(T2-T5) contains graded levels of enzyme supplemented cassava peel meal to replace maize at 25, 50, 75 and 100%. The compositions of the experimental diets are presented in Tables 1 and 2.

**Experimental Design and Management:** 120 day old Anak 2000 broiler chicks were used for this experiment. The chicks were brooded and managed for four weeks.

The birds were randomly allocated to five dietary treatments in the completely randomized design and were replicated three times with eight (8) birds per replicate. The birds were reared on deep litter. The birds were vaccinated and their health was well taken care of. The birds were fed with the experimental diets for a period of eight (8) weeks and clean drinking water was made available to the birds.

**Haematological Studies:** blood samples were randomly collected from thirty (30) birds on the last day of the experiment. 2mls was collected into labeled sterile universal bottles containing a pinch of dried ethyl diamine tetra acetic acid (EDTA) powder. The following haematological parameters were determined; Red blood cell (RBC) count, white blood cell (WBC) count, haemoglobin content (HB), packed cell volume (PCV). The mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC) were calculated from the result obtained above.

**Serum Biochemical Analysis:** serum was separated from the blood samples centrifugation at 4000rpm for 15 minutes and there after stored at -20°C. An auto-analyzer (Boehringer BH/Hitachi 9ii Germany) was used to determine the concentration of serum protein globulin, albumin and creatinine. All analysis followed the procedure described by Jerry *et al.* [4].

**Chemical Analysis:** proximate analysis of cassava peel and the experimental diets were carried out using the procedure described by A.O.A.C [5]

**Statistical Analysis:** data obtained were subjected to analysis of variance (ANOVA) as described by Steel and Torrie [6] while treatment means were separated using Duncan multiple range test.

**RESULTS AND DISCUSSION**

The results of proximate analysis of cassava peel and the experimental diet are presented in Tables 3 - 5. While result of haematological parameters and serum biochemistry are summarized in Table 6 and 7.

The effect of dietary treatment on haematology showed significant difference (P<0.05) in all the parameters investigated. All the values recorded compete favourably with normal range for broiler chickens except birds on treatment 4 and 5 which has slightly lower MCV value. The values for PCV, Hb, RBC, WBC and creatinine were significantly higher in enzyme treated CPM group than the control group. This was an indication that enzyme supplementation has a positive effect on all the blood parameters recorded which invariably has positive effect on the health of birds which resulted to low mortality of birds.

The result of serum biochemistry revealed a significant variation (P<0.05) except for serum albumin which did not differ significantly. This is an indication that the test diets had little or no effect on serum albumin. The serum total protein mean values for treatment 1, 2 and 3 were significantly higher than the mean values for treatment 4 and 5. This indicate that a higher level of CPM reduces protein level in the body of broiler chicken.

Serum creatinine showed a significant difference among treatment means. The lower values obtained reveals that no muscular wastage which might have been possibly cause by inadequacy of protein in birds.

Table 3: Proximate Composition of Cassava peel meal

Nutrients (%)	Cassava Peel
Dry matter	82.55
Crude protein	5.46
Crude fibre	18.81
Ether extract	1.75
N.E.E	70.67
Aash	5.68

Table 4: Proximate Composition of Experimental Starter Diet

Nutrients	1	2	3	4	5
Lipid (fats)	7.05	6.45	5.98	6.57	7.20
Crude Protein	21.62	22.36	23.14	21.57	21.01
Crude fibre	14.92	0.24	8.48	11.01	13.24
Total Ash	9.34	8.37	7.97	10.42	12.50
M.E (Kcal/kg)	2864.81	2910.48	2863.45	2812.73	2784.95
Calcium	1.88	1.64	1.75	1.52	1.50
Phosphorus	0.46	0.52	0.49	0.50	0.47

Table 5: Proximate composition of Experimental Finisher Diets

Nutrients	1	2	3	4	5
Lipid (fats)	6.85	6.35	5.88	6.45	6.55
Crude Protein	19.62	20.57	21.96	20.30	19.77
Crude fibre	15.53	12.07	10.94	12.11	13.94
Total Ash	8.64	8.07	7.26	9.12	11.05
M.E (Kcal/kg)	2894.57	2994.84	2945.43	2875.61	2863.21
Calcium	1.54	1.33	1.50	1.31	1.30
Phosphorus	0.41	0.45	0.46	0.45	0.41

Table 6: Effect of diets on Haematology value of birds

Dietary treatment levels of enzyme supplemented CPM (g/kg) replacing maize						
Parameters	0	25	50	75	100	SEM
PCV (%)	26.47 <sup>a</sup>	27.24 <sup>b</sup>	29.00 <sup>c</sup>	27.00 <sup>b</sup>	27.00 <sup>b</sup>	1.06
Hb Conc (g/dl)	8.85 <sup>a</sup>	9.31 <sup>c</sup>	9.62 <sup>c</sup>	9.23 <sup>d</sup>	9.10 <sup>b</sup>	1.39
RBC Counts (x10a/c)	2.83 <sup>a</sup>	2.94 <sup>b</sup>	3.00 <sup>b</sup>	3.06 <sup>c</sup>	3.10 <sup>c</sup>	0.67
WBC Counts (x10b/l)	8.31 <sup>a</sup>	11.82 <sup>c</sup>	10.68 <sup>b</sup>	10.64 <sup>b</sup>	8.55 <sup>a</sup>	0.96
MCHC (%)	33.44 <sup>b</sup>	34.18 <sup>c</sup>	33.17 <sup>a</sup>	34.19 <sup>c</sup>	33.70 <sup>b</sup>	0.27
MCH (Pg)	31.27 <sup>c</sup>	31.67 <sup>cd</sup>	32.07 <sup>d</sup>	30.16 <sup>b</sup>	29.36 <sup>a</sup>	0.20
MCV (fl)	93.53 <sup>c</sup>	92.65 <sup>c</sup>	96.67 <sup>d</sup>	88.24 <sup>b</sup>	87.10 <sup>a</sup>	0.80

a, b, c, d. Means in the same row with the same superscripts are not significantly different from one another (P<0.05)

Table 7: Effect of diet on serum biochemistry of broiler chicken

Parameters	T1 (0.0%CPM)	T2 (25% CPM)	T3 (50% CPM)	T4 (75% CPM)	T5 (100% CPM)	SEM
Protein (g/d)	6.07 <sup>b</sup>	5.87 <sup>b</sup>	6.16 <sup>b</sup>	4.67 <sup>a</sup>	4.55 <sup>a</sup>	0.20
Creatinine (mg/d)	1.40 <sup>ab</sup>	1.41 <sup>ab</sup>	1.33 <sup>a</sup>	1.45 <sup>ab</sup>	1.51 <sup>b</sup>	1.21
Cholesterol (mg/d)	67.78 <sup>b</sup>	68.00 <sup>c</sup>	68.88 <sup>c</sup>	67.00 <sup>b</sup>	65.68 <sup>a</sup>	0.82
Globulin (g/d)	3.30 <sup>a</sup>	4.40 <sup>b</sup>	4.50 <sup>b</sup>	3.50 <sup>a</sup>	3.40 <sup>a</sup>	0.22
Albumin (g/d)	2.60 <sup>a</sup>	2.7 <sup>a</sup>	2.8 <sup>a</sup>	2.5 <sup>a</sup>	2.5 <sup>a</sup>	0.10

a, b, c, d. Means in the same row with the same superscripts are not significantly different from one another (P<0.05)

High values of cholesterol were recorded in treatments 2 and 3, while lower values were recorded in treatments 4 and 5. This showed that high levels of CPM have a reducing effect on cholesterol levels in tissue. Reducing effect is particularly helpful to humans that are very conscious of cholesterol intake.

In conclusion, studies on haematology and serum biochemistry of broiler chicken fed enzyme supplemented CPM revealed that enzyme addition to cassava peel meal is effective to overcome the antinutritive effect of hydrocyanide compound in cassava peels. This is the main reason why all the parameters on blood and serum biochemistry compete favourably with the control diet and this may be the reason for the low mortality rate. However, using CPM at inclusion rate of 50% is recommended because of its more positive outcome when compare to other levels.

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