

HAEMATOLOGY AND SERUM BIOCHEMISTRY OF GROWER RABBITS FED ACHA (*Digitaria elixis*) OFFAL BASED-DIETS SUPPLEMENTED WITH MAXIGRAINS[®] ENZYME

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ABSTRACT

Forty eight growing rabbits of mixed breeds and similar live weight were utilized in a 42 days experiment to evaluate the effect of feeding acha (fonio) offal meal-based diets supplemented with Maxigrain enzyme on their haematology and serum biochemistry. Six treatments diets namely T1, T2, T3, T4, T5 and T6 were compounded to be iso-caloric and iso-nitrogenous, the Acha Offal (AO) was included at 0, 15 and 30% while the enzyme was supplemented at 0 and 200ppm. The experiment was arranged in a 2x3 factorial fitted into Completely Randomized Design. Each treatment was replicated 4 times having two rabbits per replicate. Feed and water were provided to the animals daily and all standard routine management practices were strictly observed throughout the experiment. At the end of the feeding trial, blood samples were collected from each animal for blood analyses. Main effect of Acha offal was not significant ($p > 0.05$) on the haematological parameters except on White Blood Cell (WBC) and Mean Cell Haemoglobin Concentration (MCHC). Effect of enzymes was not different ($P > 0.05$) except on WBC (0ppm (5.75) and 200ppm (6.60)) and MCHC (0ppm (33.27) and 200ppm (33.20)). Interactive effect of Acha offal and enzyme showed that T2 had the highest WBC (8.80) while T4 had the lowest MCHC (33.10). Serum biochemical parameters were not affected by Acha offal except phosphorus where there was a significant ($P < 0.05$) reduction in 30%AO (1.35). Enzymes effect showed that animals on 0ppm had significantly ($p < 0.05$) higher phosphorus (1.83) than 200ppm (1.38). Acha offal supplemented with Maxigrain enzyme can be included in the diets of grower rabbits without adverse effect on haematological and serum biochemical indices.

Keywords: Haematology, Biochemistry, Rabbits, Fonio, Enzymes

INTRODUCTION

The rapid growth of human population has brought the competition between man and livestock for these cereal grains adding to high cost of feeds and consequently high prices of Animal products (meat and egg) resulting to very low levels of protein intake in most developing nations. Therefore, leading to the increased in cost of production, research attention is now geared towards unconventional cereal by-product that will not affect the overall feed quality. One of such cereal grain by-products that could provide energy and fibre is acha offal. Feeding cereal grains (e.g. maize bran and rice bran) as replacement for maize-based diets to rabbits have been significantly reduced the cost of producing feed for livestock reported by Ukimet *et al.* (2012). It has been reported that many of the cereals by-product and grains contain some phytochemicals which can be reduced by enzymes supplementation Alu *et al.* (2012). Similarly, studies have reported increased feed breakdown especially of fibrous feed materials into easily digestible nutrients by exogenous enzyme supplementation in monogastric feeds Ogbe *et al.* (2013). It is on this background that a research with the objective of determining the haematological and biochemical indices of grower rabbits was conducted.

MATERIALS AND METHODS

Experimental Site

These experiments were conducted at the Teaching and Research Farm of Animal Science Department of the Faculty of Agriculture, Nasarawa State University Keffi, Shabu-Lafia Campus.

Feed Ingredients, Animals and Experimental Design

Acha offal was sourced from the local acha processors within Riyom Local Government Area of Plateau State and preserved under natural condition while other ingredients such as maize, maize bran, rice bran, groundnut cake, fish meal, bone meal lysine methionine were purchased from the suppliers in Lafia, Nasarawa State. Six experimental diets were formulated to be isonitrogenous (15% crude protein) and isocaloric of (2500kcal/kg) for the grower phase with three levels inclusion of the acha offal (0, 15 and 30%). The treatments were; T1 = 0% AO with 0ppm enzymes serves as control, T2 = 0% AO with 200ppm enzymes, T3 = 15% AO with 0ppm enzymes, T4 = 15% AO

with 200ppm enzymes, T5 = 30% AO with 0ppm enzymes and T6 =30% AO with 200ppm enzymes. Forty-eight (48) rabbits of similar live weight wererandomly assigned to a test diet in a 3x2 factorial. Each of the experimental treatment was replicated four times in each pen comprising of 2rabbits each.

Hematological and Serum Biochemical Indices Analysis

At the end of the experiment, two set of container was used to collect blood samples. One set contains anticoagulant while the other was anticoagulant free. The blood samples collected into bottles containing anti- coagulant: Ethylene Diaminetetraacetic Acid (EDTA) as reported by Jain (1987) were used for hematological indices {Packed Cell Volume (PCV), Hemoglobin Concentration (HB), mean cell haemoglobin concentratrion (MCHC), Red Blood Cell (RBC), White Blood Cell (WBC)}. Serum biochemical indices such as cholesterol,total protein, albumin and globulin creatinine, Erythrocyte (calcium, magnesium and phosphorus) glyceraldehyde were analyzed using SIGMA kits (Feteris, 1965).

Table 1: Nutrients composition of the experimental diets for grower rabbits

Ingredients (%)	% of maize replace by acha offal					
	T1(0%A O +0ppm)	T2 (0%AO +200ppm)	T3 (15%A0 0ppm)	T4 (15%AO +200ppm)	T5 (30%AO +0ppm)	T6 (30%AO +200ppm)
Maize	40.00	40.00	34.00	34.00	28.00	28.00
AO*	0.00	0.00	6.00	6.00	12.00	12.00
Maize bran	15.00	15.00	15.00	15.00	15.00	15.00
GNC	10.00	10.00	10.00	10.00	10.00	10.00
Rice bran	17.75	17.75	17.75		17.75	17.75
Bone meal	2.00	2.00	2.00	2.00	2.00	2.00
Full fat soya	7.00	7.00	7.00	7.00	7.00	7.00
palm oil	2.00	2.00	2.00	2.00	2.00	2.00
Fish meal	5.00	5.00	5.00	5.00	5.00	5.00
Salt	0.25	0.25	0.25	0.25	0.25	0.25
*Premix	0.25	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25	0.25	0.25
Toxic binder	0.25	0.25	0.25	0.25	0.25	0.25
Enzymes	00.00	200.00	0.00	200.00	0.00	200.00
Total	100.00	100.00	100.00	100.00	100.00	100.00
Nutrients composition (g/kg)						
ME (Kcal/Kg)	2712.07	2712.07	2674.67	2674.67	2637.28	2637.28
Crude protein	15.71	15.71	16.01	16.01	16.31	16.31
Lysine	1.00	1.00	0.99	0.99	0.97	0.97
Methionine	0.56	0.56	0.55	0.55	0.54	0.54
Ash	4.45	4.45	4.37	4.37	4.30	4.30
Ether extract	7.11	7.11	7.12	7.12	7.14	7.14
Crude fibre	10.50	10.50	11.08	11.08	11.67	11.67
Calcium	1.16	1.16	1.16	1.16	1.16	1.16
Phosphorus	0.58	0.58	0.57	0.57	0.57	0.57

AO = acha offal, ME = metabolizable energy,

*A15,000 I.U, vitamin D3 300,000 I.U.,vitamin E 3,000 I.U., vitamin K 2.50mg, vitamin B₁ (thiamin) 200mg, Riboflavin (B₂) 600mg, pyridoxine (B₆), Niacin 40.0mg, vitamin B₁₂ 2mg, Pantothenic acid 10.0mg, folic acid 100mg, Biotin 8mg, choline chloride 50mg, anti-oxidant 12.5mg, manganese 96mg, zinc 6mg, Iron 24mg, Copper 0.6mg, Iodine 0.14mg, Selenium 24mg, cobalt 214mg

Statistical Analysis

Data collected were subjected to one or two analysis of variance (ANOVA) for factorial experiment using (SPSS, 2007) Model. Significantly different means were separated using Duncan's Multiple Range Test (Duncan, 1955). The following statistical model was used: $Y_{ijk} = U + A_i + B_j + (AB)_{ij} + e_{ijk}$ where Y_{ijk} = individual observation, U = population mean, A_i = effect of factor A, B_j = effect of factor B, and AB_{ij} = effect of interaction of factor A & B.

RESULTS AND DISCUSSION

The main and treatment effect of acha offal and enzymes on haematological parameters of grower rabbits are presented in Table 2. The main effect of acha offal was not significant ($p > 0.05$) except on White Blood Cell (WBC) and MCHC. The WBC value of control was significantly higher than 15% and 30% acha offal included diets. The result of MCHC was significantly ($p < 0.05$) higher in control and 30% acha offal than in 15% acha offal fed rabbits. Thenon-variation in PCV between the control and other treatments indicates that the dietary treatments do not caused anaemic condition to the animals. This agreed with Ogundipe and Johnson (2012) who revealed that maize offal did not caused adverse effect on the haematological parameters of rabbits. Main effect of enzymes on haematological parameters of grower rabbits showed no significant ($p > 0.05$) difference between the treatments (0ppm and 200ppm enzymes) except on the value of WBC and MCHC where the highest WBC and MCHC was recorded from animals fed 200ppm and 0ppm enzymes included diets respectively. The increased value of WBC due to inclusion of enzymes suggests an increased immunity in the animals. Thetreatment effect of acha offal and enzyme on haematological parameters of grower rabbit showed no significant ($p > 0.05$) difference all the parameters except on WBC and MCHC values. The significantly ($p < 0.05$) highest value of WBC (8.80) was recorded from T_2 . Meanwhile T_1 , T_3 , T_4 , T_5 and T_6 were not significantly ($p > 0.05$) different from each other. MCHC (33.10) was significantly ($p < 0.05$) lower in T_4 than the rest of the treatments. The increased value of WBC due to inclusion of enzymes suggests an increased immunity in the animals.

Table 2: Main and treatment effect of acha offal and enzyme(Maxigrain) on haematological parameters of grower rabbits

Treatments	Parameters								
	PCV(%)	HBC(g/dl)	RBC($\times 10^9/L$)	WBC($\times 10^9/L$)	Neutrophil(%)	Lymphocyte(%)	MCV(pg)	MCH	MCHC
Acha offal									
0%	40.00	13.30	3.98	7.35 ^a	56.75	43.00	99.98	32.65	33.28 ^a
15%	36.50	12.13	3.6	5.25 ^b	60.25	37.75	101.43	33.73	33.18 ^b
30%	35.75	11.90	3.52	5.93 ^b	55.25	44.25	101.70	33.83	33.25 ^a
SEM	1.93	0.65	0.20	0.37	3.73	4.06	0.71	0.65	0.02
LOS	NS	NS	NS	*	NS	NS	NS	NS	*
Enzyme									
0ppm	36.33	12.08	3.59	5.75 ^b	56.50	42.67	100.87	33.17	33.27 ^a
200ppm	38.50	12.80	3.81	6.60 ^a	58.33	40.67	101.20	33.63	33.20 ^b
SEM	1.58	0.53	0.17	0.30	3.04	3.32	0.58	0.53	0.02
LOS	NS	NS	NS	*	NS	NS	NS	NS	*
T1	38.50	12.80	3.84	5.90 ^b	57.50	42.50	99.15	31.80	33.25 ^a
T2	41.50	13.80	4.12	8.80 ^a	56.00	43.50	100.80	33.50	33.30 ^a
T3	36.00	11.95	3.56	5.70 ^b	60.50	37.00	101.30	33.70	33.25 ^a
T4	37.00	12.30	3.65	4.80 ^b	60.00	38.50	101.55	33.75	33.10 ^b
T5	34.50	11.50	3.38	5.65 ^b	51.50	48.50	102.15	34.00	33.30 ^a
T6	37.00	12.30	3.66	6.20 ^b	59.00	40.00	101.25	33.65	33.20 ^a
SEM	2.73	0.92	0.29	0.52	5.27	5.74	1.00	0.92	0.03
LOS	NS	NS	NS	*	NS	NS	NS	NS	*

ab means on the same column having different superscript differ significantly ($p < 0.05$); NS = not significantly different ($p > 0.05$); SEM = standard error of mean; LOS = level of significant; PCV = Packed cell volume; HBC = Haemoglobin count (g/dl); RBC = Red blood cell ($\times 10^9/L$); WBC = White blood cell ($\times 10^9/L$); MCV = mean cell volume(pg); MCH = Mean corpuscular haemoglobin (fl) = MCHC = Mean cellhaemoglobin concentration($\times 10^9/L$)

The main and treatment effects of acha offal and enzyme on serum biochemical indices of grower rabbits are presented in Table 3. The main effect of acha offal does not significantly ($P > 0.05$) affected the serum biochemical parameters except on phosphorus where there was significant ($P < 0.05$) reduction in 30% than 0% and 15% acha offal fed rabbits. There was significant ($P < 0.05$) effect of enzyme on phosphorus and calcium values. A significant ($p < 0.05$) reduction in the value of Phosphorus was recorded and an increased calcium level of the animals was recorded when 200ppm enzymes was included in the diets. The treatment showed no significant ($P > 0.05$) difference between the treatments except on the values of phosphorus, globulin and calcium where there was significant ($P < 0.05$) difference. Phosphorus was significantly ($P < 0.05$) higher in T₁ then in the rest of the treatments. While Globulin was significantly lower in animals fed T₆ diets although no difference

($P > 0.05$) from T_1 fed animals. This showed that the immunity of the animals is still maintained even when fed the diets. Rabbits fed T_1 , T_2 , T_3 , T_4 and T_5 had no significant ($P > 0.05$) calcium value. This showed that the needed calcium for bone formation in the animals is not affected by the dietary treatments.

CONCLUSION AND RECOMMENDATION

Table 3: Main and interaction effect of acha offal and enzyme(maxigrain) on serum biochemical indices of grower rabbits

Parameters Treatment	CR	UR	T.PROT EIN	Albumin (g/dl)	Glucose	CHO	GOT	P(g/dl)	GLOB	Mg	Calcium	HDL	TR
Acha offal													
0%	90.00	5.03	71.75	31.5	6.30	4.55	56.25	1.78 ^a	31.00	1.15	2.08	1.03	1.18
15%	103.5	5.10	71.50	33.5	6.20	4.45	69.5	1.70 ^a	33.50	1.18	2.60	0.93	1.10
30%	97.50	5.45	69.75	31.25	6.70	4.35	46	1.35 ^b	29.25	1.25	2.65	1.13	1.23
SEM	17.41	0.78	2.86	2.33	0.80	0.32	9.5	0.06	2.40	0.11	0.16	0.08	0.08
LOS	NS	NS	NS	NS	NS	NS	NS	*	NS	NS	NS	NS	NS
Enzymes													
0ppm	89.50	5.05	70.00	31.00	6.60	4.50	56.50	1.83 ^a	33.00	1.12	2.20 ^b	1.07	1.17
200ppm	104.5	5.33	72.00	33.17	6.20	4.40	58.00	1.38 ^b	29.50	1.27	2.68 ^a	0.98	1.17
SEM	14.21	0.64	2.33	1.90	0.65	0.26	7.76	0.05	1.96	0.09	0.13	0.07	0.07
LOS	NS	NS	NS	NS	NS	NS	NS	*	NS	NS	*	NS	NS
T1	99.50	5.35	69.00	26.50	6.60	4.60	51.00	2.40 ^a	27.00 ^{ab}	1.10	2.05 ^b	1.05	1.20
T2	80.50	4.70	74.50	36.50	6.00	4.50	61.50	1.15 ^c	35.00 ^a	1.20	2.10 ^b	1.00	1.15
T3	77.50	4.50	67.50	31.50	5.75	4.15	66.50	1.65 ^b	34.00 ^a	1.15	2.55 ^{ab}	0.95	1.10
T4	129.50	5.70	75.50	35.50	6.65	4.75	72.50	1.75 ^b	33.00 ^a	1.20	2.65 ^{ab}	0.90	1.10
T5	91.50	5.30	73.50	35.00	7.45	4.75	52.00	1.45 ^{bc}	38.00 ^a	1.10	2.00 ^b	1.20	1.20
T6	103.50	5.60	66.00	27.50	5.95	3.95	40.00	1.25 ^c	20.50 ^b	1.40	3.30 ^a	1.05	1.25
SEM	24.62	1.11	4.04	3.00	1.13	0.46	13.44	0.08	3.40	0.15	0.23	0.11	0.12
LOS	NS	NS	NS	NS	NS	NS	NS	*	*	NS	*	NS	NS

^{abc} means on the same column having different superscript differ significantly ($p < 0.05$); NS = not significantly different ($p > 0.05$); SEM = standard error of mean; LOS = level of significant; CR = creatinine (umol/L); T. protein = Total protein (g/dl); G = Glucose (mmol/L); CHO = Cholesterol (mmol/L); GLOB = Globulin (g/dl); HDL = high density lipoprotein(mg/dl); TR = Tryglyceride(mg/dl); UR = UREA(umol/L); Mg =magnesium

Acha offal based diets supplemented with maxigrain enzymes could be fed to grower rabbits without adverse effect on haematological and serum biochemical indices of the animals.

REFERENCES

- Alu, S.E. (2012). Nutrient digestibility and serum biochemistry of laying quails (*Cortunix japonica*) fed sugarcane scrapping meal-based diets supplemented with exogenous enzyme. *IOSR Journal of Agriculture and Veterinary Science*, 1:29-35
- Duncan, D.B. (1955). Multiple Ranges and Multiple F-Test Biometrics, 11:1-42.
- Elijah, I. O and Ruth, T. S. O. (2012).The effect of probiotic and prebiotic feed supplementation on chicken Health and Gut micro flora: A review *International Journal of Animal and Veterinary Advances* 4(2): 135 – 143.
- Feteris, W.A. 1965. A serum glucose method without protein precipitation. *American Journal of Medical Technology* 31: 17-2
- Jain, P.C. (1987). Effect of sodium fluoride on erythrocyte membrane function – with reference to metal ion transport in rabbit's chemosphere 16(5):1087-1094.
- Ogbe, A. O., Astong, M., Alu, S.E andObeka, A.D. (2013) .Utilization of melon Husk with wild mushroom (*Ganoderma op*) and Enzyme supplement: Effect on performance of Rabbits chicken. *International Journal of Resource studies in Biosciences* 1(2): 1 – 10.
- Ogunsipe, M. H. and Johnson, A. O. (2012). Effect of millet offal-based diets on performance, carcass cuts and haematological profile of growing rabbits. *African Journal of Food Science* 6(10):280-286.
- SPSS (2007). Statistical package for social science 160 Brief guide :Spssinc 233south wacker drive,11th floor Chicago IL 60606-6412 16.
- Ukim, C.I., Ojewola, G. S., Obun, C.O., Ndelekwule, E.N (2012). Performance and carcass organ weight of broilers chicks fed graded levels of acha grains. *Journal of agriculture and veterinary science*.1(2): 28-33.