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HAEMATOLOGY AND SERUM BIOCHEMICAL INDICES OF BROILER CHICKEN FED DIETS CONTAINING COPPER AND YEAST

*Ogwuegbu, M.C., Ani, A.O., Edeh, H.O. Onodugo, M.O. and Aleke, E.M

Department of Animal Science, University of Nigeria Nsukka, Nigeria

*Corresponding author's email: mercy.ogwuegbu@unn.edu.ng +2347068515325

ABSTRACT

The effect of Inorganic copper and Yeast supplementation on haematology and serum biochemistry of broiler chickens was investigated. A total of 120 day old mixed sex "Arbor acre strain" broiler chicks were used for the study. The study lasted for eight weeks. The broilers were randomly allocated to four treatment groups and fed diets containing four levels of copper and yeast been at constant level (T1= 0g Yeast + 0g Copper, T2 = 32.5g Yeast + 25.0g copper, T3 = 32.5g Yeast + 37.5g copper and T4 = 32.5g Yeast + 50g copper respectively per 25kg of diet.) Each group was replicated three times with 10 birds per replicate in a Completely Randomized Design (CRD). The result showed that Significant ($p < 0.05$) differences occurred among treatments in most of the parameters studied. Broiler birds fed T2, T3 and T4 had the higher ($p < 0.05$) HB than T1. The result also shows that the urea and cholesterol level was highest ($p < 0.05$) for birds fed T1 when compared to other treatment groups. It was concluded that T2 and T3 can be safely included in broiler diet for an improved health promoting blood cells.

Keywords: Inorganic copper, Yeast, Heamatology, Serum biochemical

INTRODUCTION

One of the most important sources of animal protein for human consumption is broilers chickens. Due to the increase in human population, the demand for animal protein has been on the increase (Oyeagu et al., 2019). To meet with the required protein intake for the populace, Antibiotic Growth Promoters (AGP) have been incorporated into poultry diets due to its favourable effects on growth rate, feed consumption and feed efficiency (Ogwuegbu et al., 2021). Although, there are increasing concerns that the constant inclusions of these synthetic antibiotics has lead to the rise of antibiotic resistance in many pathogenic and opportunistic bacteria (Ogwuegbu et al., 2021). Due to the public concern about adverse effects of these antibiotics, animal nutritionist are researching on the alternatives to these synthetic antibiotics that can successfully replace the use of these AGPs without any deleterious effects on the animal (Hassan et al., 2018). Yeast (*Saccharomyces cerevisiae*) could possibly be an alternative to the feed antibiotics because of their beneficial roles in the health of poultry (Dhama et al., 2015). In other hand, one of the most critical of the essential trace minerals required by poultry and can maintain proper body functions and health is copper with recommended inclusion level of about 5-8mg/kg (NRC 1994; Raza et al., 2019). Hence, considering the importance of copper and yeast, the present study was designed to evaluate the potential effects of the inclusion of yeast and copper as growth promoter in broiler chicken using heamatology and biochemical indices.

MATERIALS AND METHODS

The study was conducted at Department of Animal Science Teaching and Research Farm, University of Nigeria, Nsukka. One hundred and twenty (120) day old broilers (Arbor acre) were randomly divided into four groups of thirty birds each. The groups were randomly assigned to four experimental diets containing T1= 0g Yeast + 0g Copper, T2 = 32.5g Yeast + 25.0g copper, T3 = 32.5g Yeast + 37.5g copper and T4 = 32.5g Yeast + 50g copper respectively per 25kg of diet respectively per 25kg of diet. Each treatment was

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replicated three times with ten birds per replicate placed in a 2.6 x 3m deep liter pens with fresh wood shavings. The percentage of starter and finisher feeds is shown in table 1. Feed and water were provided *ad libitum* every morning from 7:00 am- 8:00am and the birds were properly vaccinated. Data collected were subjected to analysis of variance as described for Completely Randomized Design (Steel and Torrie, 1980) and differences between treatment means were separated using Duncan's New Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

Table 2 shows the growth haematology of broiler birds fed diets containing copper and yeast. All the haematological parameters considered in this study were significantly ($p < 0.05$) affected by the treatments except for RBC at finisher phase. The result showed that birds fed T2, T3 and T4 had higher ($p < 0.05$) PCV and RBC than T1 at the starter phase. Birds fed T2, T3 and T4 had higher ($p < 0.05$) HB than T1. During the finisher phase, the HB were statistically highest ($p < 0.05$) with birds fed T2, while T1 had the lowest ($p < 0.05$) HB values. The result of the present study suggests that inclusion of yeast and copper did not constitute any harmful effect to the broilers and are also within the normal range for broiler chickens. This supports the findings of (Khan and Zafar, 2005) who stated that haematological parameters are good indicators of the physiological status of animals.

Table 3 shows the serum biochemical indices of broiler birds fed different supplemental levels of copper and yeast. Birds fed copper and yeast showed significant differences ($p < 0.05$) in most of the serum biochemical parameters except for protein, ALP, AST and ALT at both phases. The result showed that the glucose level of birds fed T3 were highest ($p < 0.05$) compared to other treatments. Birds fed T1 had the highest urea and cholesterol level compared to other treatments at starter phase and finisher phase. The findings is in line with the result of (Shareef et al., 2009; Skrivan et al., 2009) who observed a decrease in urea and cholesterol levels of broiler chickens fed diet containing copper sulphate (CuSO_4) and yeast. In the present study, the inclusion of copper and yeast reduced the urea value and improved the normal functioning of the liver in removing waste and toxic substances from the body of the animal.

CONCLUSION

The result of the study showed that up to 37.5g Yeast + 25g copper/ 25kg feed can be included in the chicken diets for improved hemato-biochemical profile and can be used successfully as a potent alternative to antibiotics without any deleterious effects on the animals within 8 weeks.

RECOMMENDATION

It is therefore recommended that yeast and inorganic copper can be used as an effective growth promoter in broiler diets for the improvement of the bird's physiological status.

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Table 1: Percentage compositions of the experimental diets for starter and finisher phase

Ingredients (%) Diets	Starter(kg)	Finisher(kg)
Maize	40.00	43.00
Soybean meal	33.6	22.00
Groundnut cake	24.00	16.00
Palm kernel cake	10.40	16.00
Fish meal	3.00	2.00
Fixed ingredients*	13.00	13.00
TOTAL	100	100
Calculated Composition:		
Crude protein (%)	23.36	20.12
Energy(Mcal/kg ME)	2.87	2.93
Crude fibre(%)	4.91	4.39

Fixed ingredients: 8% wheat offal, 4% bone meal, 0.25% iodized salt, 0.25% Vit-min Premix, 0.25% methionine, 0.25 lysine.

Table 2: Haematology of broiler birds fed diets containing copper and yeast for starter and finisher phase

Treatment/Parameters	T1	T2	T3	T4	SEM
Starter					
PCV (%)	25.25 ^b	27.00 ^a	27.50 ^a	27.00 ^a	0.44
RBC((X103/mm3)	1.19 ^b	2.87 ^a	2.76 ^a	2.63 ^a	0.17
HB (g/100ml)	7.06 ^c	9.48 ^a	9.08 ^a	8.07 ^{ab}	1.29
MCV (m3)	106.70 ^{ab}	84.35 ^b	132.88 ^a	102.84 ^{ab}	6.97
MCH (%)	35.20 ^a	29.64 ^b	37.38 ^a	31.21 ^b	2.19
MCHC (%)	32.93 ^{ab}	35.13 ^a	28.06 ^b	30.07 ^{ab}	1.27



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Finisher

PCV (%)	24.00 ^b	27.00 ^a	28.33 ^a	26.83 ^a	0.73
RBC((X103/mm3)	2.65	2.42	2.30	2.53	0.10
HB (g/100ml)	5.06 ^c	7.68 ^a	6.01 ^b	6.19 ^b	0.27
MCV (m3)	105.70 ^{ab}	112.85 ^a	106.96 ^{ab}	107.56 ^{ab}	2.94
MCH (%)	26.72 ^a	23.78 ^b	26.98 ^a	25.14 ^{ab}	1.48
MCHC (%)	25.31 ^a	21.25 ^b	24.98 ^a	23.14 ^{ab}	1.16

a,b,c,dRow means with different superscripts differ significantly. SEM: Standard error of the mean.

Table 3: Serum biochemistry of broiler birds fed diets containing copper and yeast for starter and finisher phase

Treatment/ Parameters	T1	T2	T3	T4	SEM
Starter					
Protein (g/dl)	3.28	3.27	3.48	3.32	0.10
Glucose (g/dl)	9.87 ^d	13.81 ^{ab}	14.95 ^a	12.79 ^c	0.23
Urea (mg/dl)	59.52 ^a	40.96 ^b	41.08 ^b	41.25 ^b	1.08
Cholesterol (mg/dl)	161.05 ^a	151.01 ^b	141.97 ^c	153.79 ^b	0.28
Creatine (mg/dl)	0.69 ^b	0.71 ^b	0.76 ^a	0.70 ^b	0.03
ALP (U/L)	29.98	30.02	30.09	29.95	0.19
AST(U/L)	35.61	35.55	35.71	36.01	0.20
ALT (U/L)	25.09	25.10	25.95	26.00	0.19
Finisher					
Protein (g/dl)	5.12	4.87	4.92	4.73	0.09
Glucose (g/dl)	11.71 ^f	14.99 ^{ab}	16.47 ^a	14.68 ^{ab}	0.22
Urea (mg/dl)	62.89 ^a	42.67 ^d	44.89 ^c	44.76 ^c	1.07
Cholesterol (mg/dl)	181.06 ^a	163.19 ^c	155.87 ^d	160.15 ^c	0.39
Creatine (mg/dl)	0.57	0.61	0.63	0.56	0.02
ALP (U/L)	44.61	44.26	44.00	43.18	0.31
AST(U/L)	64.21	64.36	65.33	64.66	0.21
ALT (U/L)	28.08	29.00	28.25	28.19	0.27

a,b,c,dRow means with different superscripts differ significantly. SEM: Standard error of the mean