

EFFECT OF CRUDE ONION EXTRACT ON HAEMATOLOGICAL PARAMETERS OF BROILER CHICKENS

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Abstract

The study was carried out to determine the effect of onion extract on haematological parameters of broiler chickens. A total of one hundred and fifty (150) day-old broiler Arbor acre chicks (mixed sex) were reared up to eight (8) weeks of age and used for the study. The chickens were randomly allocated to five dietary treatment groups with thirty (30) birds per treatment. Each group was further sub-divided into three replicates of 10 birds per replicate in a Complete Randomized Design (CRD). The onion extract was squeezed out with a sieve into a container. The extract was prepared daily and administered to the birds at graded levels of 2.5 mls, 5 mls, 7.5 mls and 10 mls in a litre of drinking water for T₂, T₃, T₄ and T₅ respectively, while T₁ was the control (0.0ml) and was fed to the birds ad-libitum. The result showed that there were no significant ($P > 0.05$) differences among treatment groups for all the haematological parameters except red blood cells (RBC) mean corpuscular volume (MCV) and mean corpuscular haemoglobin (MCH). In conclusion haematological parameters of broiler chickens revealed that onion extract has no adverse effect on the birds.

Keywords: Broiler Chickens, Crude Onion Extract and Haematology.

Description of Problem

The poultry industry is under great pressure to minimize the use of antibiotics because its dietary use has been resulted in controversial problems such as development of antibiotic resistant bacteria and drug residue in the final product which can be harmful to the consumers. Effort are geared toward increasingly exploring natural feed additives as alternatives to synthetic growth promoters due to consumer demand for safer and more organic poultry products. Among these, medicinal plants such as onion (*Allium cepa*) have gained attention for their antioxidant, antimicrobial, and immunomodulatory properties (1). Onion contains active phytochemicals like flavonoids (e.g., quercetin), sulfur compounds, and phenolics that may influence physiological and haematological parameters in poultry (2). Haematological parameters are critical indicators of the physiological and immune status of chickens, often reflecting the health effects of dietary supplements. Previous studies suggest that onion extract can positively impact red blood cell count, haemoglobin concentration, and white blood cell profiles, thereby enhancing oxygen transport and immune function (3). The

bioactive compounds in onion may stimulate haematopoiesis and protect erythrocytes against oxidative damage (4). Furthermore, replacing antibiotics with onion extract in broiler diets has shown promising effects not only on growth performance but also on blood biochemistry and haematological profiles, suggesting its potential as a safe and effective alternative growth promoter (5). This study is therefore aimed at investigating the effects of onion extract on the haematological parameters of broiler chickens.

MATERIALS AND METHODS

Location of the study

The study was conducted at the Poultry Unit of the Teaching and Research Farm of the Department of Animal Science, Faculty of Agriculture, University of Maiduguri, Borno State, Nigeria.

Experimental stock, Management and Design

One hundred and fifty (150) day-old broiler chicks *Arbor acre* strain were randomly allotted to five dietary groups with thirty (30) birds in a treatment. Each treatment was divided into replicates of ten (10) birds in a completely randomized design (CRD). Prior to arrival of the chicks, the rearing pens were thoroughly swept, washed with detergent and disinfected with a suitable disinfectant (IZAL) so as to eliminate

any disease causing organism present that may be a source of infection to the chicks. All brooding equipment was cleaned, washed and disinfected. Blue-flamed heating kerosene stove were used as a source of heat during brooding. Brown papers were used for the first seven days of brooding on the cemented floor;- thereafter, wood shavings were spread on the cemented floor to a depth of about two centimetres (2 cm) to serve as an insulator and also absorb moisture from droppings. The birds were vaccinated strictly based on the vaccination schedule recommended for the North East zones. The chicks were switched over from the broiler starter diet to finisher diet at 5th week of age.

Procurement and Preparation of onion extract

The test material onion, (*Allium cepa*) was purchased from *Gamboru Market* in Maiduguri Metropolis. The onion was carefully selected to ensure that they are disease free before extraction. First, the bulbs of the onion layers were separated and washed with clean water. After which the bulbs were weighed, 25% of clean water by weight of the onion bulb was added and they were blended into a paste using an electrical blender. The paste was then squeezed out with a sieve into a container to obtain the extract. The extract was prepared daily and administered to the birds at graded levels of 0.0 (Treatment 1), 0.25 (Treatment 2), 0.50 (Treatment 3), 0.75 (Treatment 4), and 1.0% (Treatment 5) via drinking water respectively and was fed to the bird *ad-libitum*.

Data Collection /chemical analysis

The haematological parameters measured were packed cell volume (PCV), red blood cells (RBC) count, white blood cells (WBC) count, haemoglobin concentration (Hb) and Leucocytes differential (LD) count. All determination was in accordance with the methods outlined by (6)

Statistical Analysis

All data obtained were subjected to analysis of variance (ANOVA) using completely randomized design (7). Differences between the means were separated using least significant difference (LSD) at 95% confidence level ($p < 0.05$) with the aid of Statistix 10.0.

Experimental diets

The Broiler starter and finisher diets are presented in Table 1 below.

Table 1: Ingredients Composition and Calculated Analysis of Broiler Starter and Finisher Diets (%)

Ingredients	Starter	Finisher
Maize	54.00	58.00
Groundnut Cake	20.00	5.00
Soy Bean Meal	10.00	20.50
Wheat offal	7.50	8.50
Fish meal	5.00	4.00
Bone ash	2.00	2.50
Limestone	0.50	0.50
Min-vit premix*	0.40	0.40
Methionine	0.30	0.30
Lysine	0.10	0.10
Salt	0.20	0.20
TOTAL	100.00	100.00

* 2.5kg composition of broiler starter and finisher premix supplying the following: VitaminA =12000mg, VitaminD₃=300000mg, VitaminE=30000mg, VitaminK₃ 2000mg, VitaminB₁=2000mg, VitaminB₂=1,600mg, Niacin=8,000mg, Pantothenic = 2,000mg, VitaminB₆=600, VitaminB₁₂=4mg,Folicacid=200mg,BiotinH₂=300mg,Choline+Chloride=7,0000mg,Cobalt=80mg,Copper=1,200mg,Iodine=400mg,Iron=8000mg,Manganese=1,6000mg,Selenium=80mg,Zinc=1,2000mg and Antioxidant=500m*

RESULTS AND DISCUSSION

Proximate Composition of the Broiler Starter and Finisher Diets

Proximate composition of the broiler starter and finisher diets are presented in Table 2.

Haematology of Broiler Chickens fed Onion Extracts of Varying Concentration

The result of haematological parameters and differential leucocyte counts are presented in Table 3. There were no significant ($P > 0.05$) differences for packed cell volume, haemoglobin, white blood cell, mean corpuscular haemoglobin concentrate, monocyte and eosinophil while red blood cell, mean corpuscular volume, mean corpuscular haemoglobin, neutrophil and lymphocyte were significant ($P < 0.05$) among treatment groups for both haematology and differential leucocyte count respectively.

The PCV (22.33 to 24.67%) recorded in this study were lower than the range (31.67 to 34.67%) and (35.9 to 41%) reported (9) and (10)

for chickens respectively .The results for haemoglobin (Hb) and white blood cell (WBC) did not show any significant ($P>0.05$) difference among treatment groups.

Table 2: Proximate Composition of the Broiler Starter and Finisher Diets

Nutrients (%)	Broiler Starter	Broiler finisher
Crude protein	23.02	19.55
Crude fibre	5.85	7.92
Ether extract	5.96	5.58
Ash	6.47	5.52
Nitrogen-free extract	58.70	61.43
ME (Kcal/Kg)	3209.00	3325.38

Nitrogen-free extract was calculated by difference: $NFE = 100 - (\%CP + \%EE + \%CF + \%Ash)$, while ME = Metabolisable energy was calculated according to (8) as follows; $ME = 37x \%CP + 81x \%EE + 35x \%NFE$.

Table 3: Haematology of Broiler Chickens fed Graded Levels of Crude Onion Extracts

Parameters	T1 (0%)	T2 (0.25%)	T3 (0.50%)	T4 (0.75%)	T5 (1.00%)	SEM
Packed cell volume (%)	24.00	23.00	24.67	24.67	22.33	0.73 ^{NS}
Haemoglobin (g/dl)	7.97	7.63	8.20	8.20	8.07	0.21 ^{NS}
White blood cell ($\times 10^6$)	11.13	12.93	12.63	11.57	11.87	0.49 ^{NS}
Red blood cell ($\times 10^6$)	15.33 ^c	17.93 ^b	19.20 ^a	17.67 ^b	17.73 ^b	0.34 [*]
MCV (fl)	15.68 ^a	12.82 ^b	12.85 ^b	13.98 ^{ab}	12.62 ^b	0.54 [*]
MCH (pg)	5.21 ^a	4.26 ^b	4.27 ^b	4.65 ^b	4.55 ^b	0.14 [*]
MCHC (%)	33.19	33.19	33.25	33.25	36.46	1.46 ^{NS}
Differential Leucocyte Count (%)						
Neutrophil	21.67 ^d	36.67 ^a	21.67 ^d	19.00 ^c	33.67 ^b	4.41 [*]
Lymphocyte	76.33 ^{ab}	62.67 ^d	74.33 ^b	79.00 ^a	66.00 ^c	3.84 [*]
Monocyte	0.00	0.00	0.33	0.00	0.00	0.15 ^{NS}
Eosinophil	2.00	0.67	3.67	2.00	0.33	0.97 ^{NS}
Basophil	0.00	0.00	0.00	0.00	0.00	NTS

SEM = Standard Error of Means , NS = Not Significant ($P>0.05$), * = Significant ($P<0.05$), a, b, c, = Mean in the same row bearing different superscripts differ significantly ($P<0.05$), MCV = Mean corpuscular volume, MCH = Mean corpuscular hemoglobin, MCHC = Mean corpuscular hemoglobin concentrate , NTS = Not tested statistically mean corpuscular volume (MCV) ,mean corpuscular haemoglobin (MCH), neutrophils and lymphocyte

The range (7.63 to 8.20g/dl) and (11.57 to 12.93 $\times 10^6$) for Hb and WBC respectively, are lower than the normal range of (11.60 to 13.68 g/dl) and (4.21 to 4.32 $\times 10^3$ /ml) outlined by (10). The red blood cells ranged (15.33 to 19.20 $\times 10^6$). The broiler chickens fed T3 had the highest values of red blood cells compared to other treatment groups while the least was observed in T1 which is the control. The values obtained in this study were lower than the range of 31.67 to 34.67 $\times 10^6$ and 35.9 to 41 $\times 10^6$ as reported by (9) and (10) respectively. However, the birds did not showed sign of anemia. It is therefore onion extract does not have any adverse effect on the bird's red blood cell count. The mean corpuscular volume (MCV) of the birds were ranged from 12.62 to 15.68 fl. Treatment 2, 3

and 5 were statistically similar. While highest MCV values (15.68 fl) was observed in T1 (control) and the least (12.62 fl) was obtained in T5 (1.00% onion extract). This indicates that the bird did not showed sign of anemia. The mean corpuscular haemoglobin (MCH) birds fed T1 is superior ($P<0.05$) than other treatment groups. The values obtained in this study were similar to the report (4.87pg) of (11). This is an indication that the test material exerts effect on broiler chickens MCH. The mean corpuscular haemoglobin concentration (MCHC) was not significantly ($P>0.05$) different among the treatment groups. The values were (33.19, 33.25, 33.25 and 36.46%) for treatment 2, 3, 4 and 5 respectively. However the result in this study is similar to the values reported by (10) as normal values for chickens. However the values are

within the normal range for chickens, thus the birds had normal physiological status (13). The differential leucocytes counts observed showed significant ($P < 0.05$) differences for neutrophils and lymphocyte among the treatment groups. The neutrophils values ranged from 19.00 to 36.67% were similar to the work of (1). (14) reported that, increase in the number of neutrophils (neutrophilia) (82%) generally indicates the existence of recent (acute) infection, usually with bacteria such as streptococci and staphylococci especially in septicemia and it may also be due to an acute loss of RBC particularly in acute haemolytic anaemia, while decrease in the number of neutrophils (neutropenia) ($< 50\%$) occur in overwhelming bacterial infection and it may indicate bone marrow damage by toxins (15), thus too low or too high a value is caused by variety of possible health condition with medication effect and bacterial infection responsible for lower values as reported by (16). The result of this study indicated that the birds does not suffer bacterial infection, therefore onion extract had no any adverse effect on broiler chickens neutrophil. The lymphocytes values (62.67 to 79.00%) obtained in this study were greater than the range (41.38 to 55.33%) reported by (9). However, the values (64.67%) were in line with the result of (12). Decrease in the number of lymphocytes (lymphopenia) ($< 20\%$) occur in increased activity of the adrenal cortex (hyper-adreno corticalism) and the condition may be stimulated by the addition of large doses of corticosteroids and increase in the number of lymphocytes (lymphocytosis) is associated with recovery from viral infection (17). Increase in the number of monocyte (monocytosis) occurs in chronic diseases while decrease in the number (monopenia) is rarely recorded. there were no significant ($P > 0.05$) difference among all the treatment groups. The values recorded for all the treatments were however, within the normal physiological limit for chickens reported by (14). The values of eosinophils were 2.00, 0.67, 3.67, 2.00 and 0.33 for treatment 1, 2, 3, 4 and 5 respectively. The values showed no significant ($P > 0.05$) difference among treatment. The values were

within the value 4.50% reported by (18) and (0 to 5%) reported by (14) as normal physiological limits for chickens. Eosinophils help to eliminate the parasites in the system, by reducing toxic substances which bind the infecting organism (10).

Conclusion and Application

The study concluded that haematological parameters of broiler chickens revealed that onion extract has no adverse effect on the bird's health and therefore, onion extract can be administered to broiler chickens at a level of up to 10 mls in a litre of drinking water.

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