

**NSAP****47th Annual Conference**
(JOS 2022)**CONFERENCE PROCEEDINGS**THEME
SECURING ANIMAL
AGRICULTURE AMIDST
GLOBAL CHALLENGES**EFFECT OF USING ALKALINE SOLUTIONS IN MAIZE TREATMENT ON THE SERUM BIOCHEMISTRY OF BROILERS*****Ahutu, I.A., Amana, O.C., Oyewole, B.O. and Abdulhamid, A.A.****Department of Animal Production, Kogi State University, Anyigba, Kogi State*****Corresponding author: ismaila.a.a@ksu.edu.ng Phone number: 08060874951****ABSTRACT**

A feeding trial that lasted for fifty-six (56) days was conducted with one hundred and forty-four (144) day old broilers to determine the effect of using alkaline solutions in maize treatment on the serum biochemistry of broilers. Four experimental diets were formulated with different alkaline solutions used in the treatment of maize: 0% (control) labelled T1, 2% K_2CO_3 (T2), 2% $Ca(OH)_2$ (T3) and 2% $CaCO_3$ (T4). The birds were randomly grouped into four (4) experimental treatment with three (3) replicates of twelve (12) birds per treatment in a completely randomized design. At the end of the experiment, three (3) birds were selected from each replicate for serum biochemistry analysis. The blood biochemical parameters measured showed significant differences ($p < 0.05$) in all the parameters except for total protein and albumin. T3 (2% $Ca(OH)_2$) and T4 (2% $CaCO_3$) showed significantly lower aspartate aminotransferase, alanine aminotransferase and total cholesterol values compared to the other treatment groups. The creatinine values of T3 (2% $Ca(OH)_2$) and T4 (2% $CaCO_3$) were also lower than the control group, but showed no significant difference ($p > 0.05$) with T2 (2% K_2CO_3). The results obtained from this experiment showed that treating maize with 2% calcium carbonate ($CaCO_3$) before using it in feed formulation for broilers did not have any adverse effect on the serum biochemical indices.

Keywords: Serum biochemistry, alkaline, maize, broiler, feed formulation

Introduction

The treatment of maize using slaked lime (nixtamalization) facilitates pericarp removal, reduces mycotoxin levels, enhances water uptake, increases gelatinization of starch granules, and improves nutritional value through increased availability of niacin (Bressani, 1990).

Serum biochemistry refers to the chemical analysis of blood serum. These parameters have been observed as good indicators of the physiological status of animal and their changes are important in assessing the response of such animals to various physiological situations (Khan and Zafar, 2005).

This study was carried out to determine the effect of using alkaline solutions in maize treatment on the serum biochemistry of finisher broilers.

Materials and Method**Experimental Site**

The experiment was conducted at the Poultry Unit of the Livestock Teaching and Research Farm of Kogi State University, Anyigba in Dekina Local Government Area of Kogi State. Anyigba lies between Latitude $7^{\circ} 15' N$ and $7^{\circ} 21' E$ of the Equator and Longitude $7^{\circ} 11' N$ and $7^{\circ} 32' E$ of the Greenwich Meridian with an altitude of about 420m above Sea level. The zone is characterized by 6-7 months of average annual rainfall of about 1600mm and the daily temperature ranges between $25^{\circ}C$ and $35^{\circ}C$ (Ifatimehin *et al.*, 2011).

Experimental Diets

Potassium carbonate (K_2CO_3), Calcium hydroxide ($Ca(OH)_2$) and Calcium carbonate ($CaCO_3$) were obtained from the Department of Chemistry, Kogi State University, Anyigba. Treatment 2 was prepared by weighing thirty-five kilograms (35kg) of maize into a drum and washed, after which 50 litres of clean water was added and heated. Just as it was close to boiling, 2% concentration of potassium carbonate (1kg) was added, stirred and allowed to boil for two (2) hours, after which it was removed from heat and

**NSAP****47th Annual
Conference
(JOS 2022)****CONFERENCE
PROCEEDINGS**THEME
**SECURING ANIMAL
AGRICULTURE AMIDST
GLOBAL CHALLENGES**

allowed to steep for sixteen (16) hours. The maize was then decanted and washed to remove the residual potassium carbonate with the pericarp, sundried and milled for compounding with other ingredients. The procedure of alkali treatment was repeated using calcium carbonate (CaCO_3) and calcium hydroxide (Ca(OH)_2) in preparation of treatments 3 and 4 respectively, while the maize used in the control (T1) was not treated.

Experimental birds, design and management

A total of one hundred and forty-four (144) day-old Arbor acre broilers were used for this experiment. The birds were allotted in a Completely Randomized Design (CRD) to four (4) experimental treatments. Treatment one (T1= control diet); Treatment two (T2 = maize treated with 2% K_2CO_3); Treatment three (T3 = maize treated with 2% Ca(OH)_2); Treatment four (T4 = maize treated with 2% CaCO_3). Each of the treatment groups had three (3) replicates with twelve (12) broilers per replicate. Standard management practices were observed i.e. vaccination and medication, with feed and water given *ad-libitum*.

Collection of Samples for Serum Analysis

At the end of the 56-day feeding trial, three (3) birds were selected from each replicate and blood samples were collected from the wing (brachial) veins for serum analysis.

Data collected for serum biochemistry were alanine aminotransferase (ALT), aspartate aminotransferase (AST), cholesterol, creatinine, total protein and albumin.

Statistical Analysis.

All data collected were analyzed using the one-way Analysis of Variance (ANOVA) with the aid of SPSS version 20. Significant means were separated using LSD at 5% level of significance.

Results and Discussion

Serum biochemical indices

The serum biochemical response of broiler chickens fed maize treated with different alkaline solutions is shown in Table 2. There were significant differences ($p < 0.05$) observed in all the values except for total protein and albumin that did not differ significantly ($p > 0.05$).

Serum biochemistry is usually used for detection of organ diseases in domestic mammals and the amount of available protein in the diets (Iyayi and Tewe, 1998). It has been reported that serum biochemical constituents are positively correlated with the quality of the diet (Adeyemi *et al.*, 2000).

The concentrations of aspartate aminotransferase (AST) and alanine aminotransferase (ALT) in the blood are bio-indicators of liver function and damage (Yildirim *et al.*, 2011). Increased levels of these enzymes are associated with liver or muscle damage, resulting from the body's response to stress (Lumeij, 2008). In this study, it was observed that the treatment groups, particularly T3 (2% K_2CO_3) and T4 (2% Ca(OH)_2) had the least values observed for both ALT and AST. This therefore suggests that alkaline treatment of the diet improved the liver functions.

Cholesterol values showed significant differences ($p < 0.05$) as the values decreased steadily across the treatments. The experimental diets were all significantly different ($p < 0.05$) and lower than the control diet. The range of values observed was 2.05-2.60mmol/L and within the range of 1.86-3.37 mmol/L in broilers reported by Ross *et al.* (1978)

Values of Creatinine observed showed significant differences ($p < 0.05$), with T1 (0%) significantly different ($p < 0.05$) to T3 (2% Ca(OH)_2) and T4 (2% CaCO_3). A value range of 0.52-0.80mg/dl was recorded. This was in line with those of Aikpitanyi and Egweh (2020). The kidney is involved in the excretion of creatinine, which is a by-product of creatinine phosphate metabolism, produced as a result of

**NSAP****47th Annual
Conference
(JOS 2022)****CONFERENCE
PROCEEDINGS**THEME
**SECURING ANIMAL
AGRICULTURE AMIDST
GLOBAL CHALLENGES**

energy production by the skeletal muscles (Esubonteng, 2011). Ultimately, a high amount of creatinine could indicate that the kidney is not functioning optimally.

The value ranges observed for total protein and albumin were 3.75 -3.99 mg/dl and 1.71-1.83g/dl respectively. These ranges were in line with those observed by (Meluzzi *et al.*, 1992). and Odunitan-Wayas *et al.*, 2018 for healthy birds. A higher concentration of albumin usually indicates dehydration while a lower concentration may be due to the liver not functioning properly possibly due to factors such as malnutrition and infection (Esubonteng, 2011). Albumin which is a protein is important in birds due to its ability to aid blood clotting and transporting of insoluble substances in the blood (Fischbach and Dunning 2009).

Conclusion and Recommendation

Based on the findings of this study, it was concluded that treating maize with 2% calcium carbonate (CaCO₃) before using it in formulation of feed for broiler finishers did not have adverse effect on the serum biochemical indices. It helps in maintaining liver functions and reducing the concentration of blood cholesterol.

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NSAP

47th Annual Conference
(JOS 2022)

CONFERENCE PROCEEDINGS

THEME
SECURING ANIMAL
AGRICULTURE AMIDST
GLOBAL CHALLENGES

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Table 1: Gross composition of the experimental diet

Ingredient	Gross composition
Maize	39.25
Groundnut cake	14.00
Soy bean (full fat)	20.00
Maize offal	23.40
Bone meal	2.50
Salt	0.25
Lysine	0.25
Methionine	0.25
Premix	0.25
Total	100
Calculated Analysis	
ME(kcal/kg)	2950.60
CP (%)	20.31
Crude fibre (%)	3.00
Calcium (%)	1.07
Phosphorus (%)	0.85
Lysine (%)	1.04
Methionine (%)	0.36

Table 2: Serum biochemistry of finisher broilers fed maize treated with different alkaline solutions

Parameter	T1(0%)	T2(2%K ₂ CO ₃)	T3(2%Ca(OH) ₂)	T4(2%Ca ₂ CO ₃)	SEM
AST(IU/ml)	59.00 ^a	55.83 ^b	52.17 ^c	51.17 ^c	1.02
ALT(IU/l)	9.17 ^a	8.00 ^a	6.17 ^b	5.50 ^b	0.48
Cholesterol (mmol/L)	2.60 ^a	2.14 ^b	2.12 ^c	2.05 ^c	0.07
Creatinine (mg/dl)	0.80 ^a	0.70 ^{ab}	0.52 ^b	0.52 ^b	0.04
Total protein (mg/dl)	3.85	3.75	3.96	3.99	0.07



NSAP

**47th Annual
Conference
(JOS 2022)**

**CONFERENCE
PROCEEDINGS**

**THEME
SECURING ANIMAL
AGRICULTURE AMIDST
GLOBAL CHALLENGES**

Albumin

(g/dl)

1.71

1.73

1.83

1.81

0.04

^{a,b,c} Means with different superscripts along the same row shows significant difference ($p < 0.05$), AST= Aspartate aminotransferase, ALT= Alanine aminotransferase, SEM= Standard Error of the Mean.