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BIOCHEMICAL PARAMETERS OF BROILER BIRDS FED *Vernonia amygdalina* AND *Guiera senegalensis* LEAF AS PHYTOGENIC FEED ADDITIVE

I. S. Harande¹, R.A.Gabi², S.M. Tanko², I.A. Garba² and M. Abubakar²

¹Department of Animal Science, College of Agriculture, Federal University of Agriculture Zuru, Kebbi State, Nigeria.

²Department of Agric Economic and Extension Service, College of Agriculture, Federal University of Agriculture Zuru, Kebbi State, Nigeria.

Corresponding Email: ibrahimshuaibuharande@gmail.com

ABSTRACT

This research was carried out in the Department of Animal Science, College of Agriculture, Federal University of Agriculture Zuru, Kebbi State. To determine some biochemical parameters of broiler birds fed *Vernonia amygdalina* and *Guiera senegalensis* leaf as phytogenic feed additive. Two hundred (200) broilers were used for this study; they were randomly allocated into four (4) dietary treatments (T₁, T₂, T₃ and T₄) replicated five with ten birds per replicate. They were fed *Vernonia amygdalina* and *Guiera senegalensis* leaf (T₁) 0 %, *Vernonia amygdalina* leaf (T₂) 0.1%, *Guiera selegalensis* leaf (T₃) 0.1% *Vernonia amygdalina* leaf and T₄ *Vernonia amygdalina* and *Guiera selegalensis* leaf 0.1%. At the end of the feeding trial the result for biochemical parameters measured revealed that there were significant differences ($P < 0.05$) in URE, CRT, AST, ALT and ALB. There was no significance difference ($P > 0.05$) in TP and ALP. The best URE numerical value was recorded in T₂ (2.70 g/dl) followed by T₃ (1.90 g/dl), T₁ (1.76 g/dl) and the lowest value was observed in T₄ (1.0 g/dl). The CRT value recorded were (0.43 mg/dl), (1.90 mg/dl) and (1.21 mg/dl) for T₁, T₂, T₃, and T₄ respectively. The largest ALP numerical value was observed in T₃ (59.63 g/dl) and the lowest in T₃ and T₄, (55.33 g/dl). T₃ recorded the highest AST values (6.66 /l) and lowest was seen in T₃ (3.33/l). The best TP value was recorded in T₂ and T₄, (59.66 g/dl) and the lowest value in T₁ (58.66 g/dl). The ALB values were (33.66 g/dl), (35.60 g/dl), (33.33 g/dl) and (32.66 g/dl) for T₁, T₂, T₃ and T₄ respectively. From the results obtained in this study it could be concluded that feeding broilers with *Vernonia amygdalina* and *Guiera senegalensis* leaf as phytogenic feed additive had no adverse effect on biochemical parameters of broilers. Therefore, from the findings of this study, it recommended that antibiotic growth promoters can be replaced with *Vernonia amygdalina* and *Guiera selegalensis* leaf in broilers diets. It is also recommended that haematological parameters and carcass analysis should be carried out, on birds fed *Vernonia amygdalina* and *Guiera senegalensis* leaf.

Keywords: *Biochemical, Parameters, Broiler, Vernonia amygdalina, Guiera senegalensis, Phytogenic, Feed Additive*

INTRODUCTION

In Nigeria, broilers provide much of protein vitamin and minerals in human diet (Mapiye et al., 2018). And they are source of cash for small and large scale farmers (Mapiye et al., 2018). Feed is essential part of livestock production which has great effect in their growth and quantity of their production. (Dairo et al., 2019). Biochemistry is the study of chemical reaction in living organism (Jezek and Klinkon, 2019). The study of biochemical parameters can provide valuable information as relating to nutrition, sex, age and physiological status of the animal (Jezek and Klinkon, 2019). Biochemical analysis of blood serum is very useful to get insight in the metabolism and health status of animals,

during diagnostic procedure it is very useful to compare the value obtain from ill animal with normal health animal (Jezek and Klinkon, 2019). Biochemical parameters responsible for various body functions induce structural and physiological abnormalities (Jezek and Klinkon, 2019). *Guiera senegalensis* commonly known as "Sabara" in Hausa is shrub of the savannah region of west and central Africa. It is widely being used in traditional medicine for the remedy of many ailment/disease. Its leaves extract is being used against dysentery, diarrhea, gastrointestinal pain and disorder, rheumatism and fever (Sule and Mohammed 2020). The astringent property of this plant was reported to be due to its tannin content

(Koumare et al., 2018). *Vernonia amygdalina* is a medium sized shrub with abundant bitter principle in every part of it. It belongs to the family composite or astaceae. The plant is known as "ewuro" a "ologhu" "shuwaka" in Yoruba, western. Igbo southern, Hausa Northern Nigerian for both therapeutic and nutritional purpose. Bitter leaf decoction of plant is a ethno medicinally employed as an anti-diabetic remedy (Okafor, 2022).

MATERIALS AND METHODS

Experimental Site and Location: The research was conducted at Poultry Unit of the Department of Animal Science, College of Agriculture, Federal University of Agriculture Zuru, Kebbi State Nigeria. Zuru is located at latitude 4°15'N to latitude 11°25'N and longitude 4°14'E to 4°14'E covering an area of about 461,884 square kilometers, and the area is at extreme South Eastern part of Kebbi State. Geographically Zuru falls within a region of crystalline rocks which form part of basement complex rocks of African shield. The climate of the area is a tropical savannah climate with average annual rainfall of about 1300 to 1500mm and a mean temperature of about 27°C. The soil of the area is a well-drained sandy-loam soil which supports many crops production. The vegetation of the area is tropical savannah wood land tall scattered and grasses which are greenish in the rainy season, but dried and dumped in the dry season. The area falls within the Northern Guinea Savannah Agro-Ecological Zone of Nigeria. (Sakaba et al., 2017).

Management of Experimental Birds: The birds were managed in the brooder house for four weeks and after the brooding, they were transferred to individual pen feed and water was provided ad-libitum with appropriate routine medication and vaccination the ration was on the basis of maize, soya beans, wheat offal, fish meal, bone meal, Premix, salt, lysine,

methionine, *Guiera senegalensis*, and *Vernonia amygdalina* Leaves.

Experimental Diets: Four (4) experimental diets were formulated as follows: Treatment one (T₁) contained only the feed ingredient, treatment two (T₂) contains *Vernonia amygdalina* 0.1kg, treatment three (T₃) contains *Guiera senegalensis* 0.1kg, treatment four (T₄) contains mixture of *Vernonia amygdalina* and *Guiera senegalensis* leaves.

Experimental Design: A total of 200 broiler birds were used for the experiment. The birds were randomly allocated into four (4) treatment groups. Each treatment was replicated five times. Each replicate consisted of 10 birds and four treatments were fed one of the experimental diets for the period of eight (8) weeks.

Sample Collection: Approximately 2ml of blood sample was taken from the wing vein of the birds and disposed into plain tube using 2ml syringe and 23g needle. All blood collected tube was kept in ice pack container to avoid denaturation of protein before taking to laboratory for analysis.

Procedure to Determination of Biochemical Parameters: The following parameters were analyzed in the sera: Aspartate Aminotransferase (AST), Albumin, Total protein (Doumas, 2021).

Aspartate Amino Transferase (AST): Principle: L-oxyglutarate + L-aspartate, Glucose + Oxaloacetate. Aspartate amino transferase activity was measured by monitoring the concentration of oxaloacetate hydrazine formed with 2,4-dinitrophenyl hydrazine.

Reagents: A reagent kit containing phosphate buffer (10 mmol, pH 7.7), L-aspartate (100mmol), L-oxoglutarate (2 mmol/l), 2,4-dinitrophenyl hydrazine (2mmol/l) and sodium hydroxide (NaOH) 0.4 M was used.

Procedure: Two (2) clean test tube was label as 'test' and "blank", then each of the test tubes contain 0.5ml of substrate buffer solution which was be placed and incubated at 37°C for 5 min, then 0.1ml of the serum was added to the 'test' tube and further incubate at aliquot of serum which was be added to the test tube label 'blank'. The mixture was shaken and allowed to stand at room temperature for 20min after which 5ml of 0.4M NaOH is added to each tube and allowed to stand for 5min. The absorbance was measured at 546nm after zeroing the instrument using the blank.

Determination of Total Serum Protein:

Principle: Alkaline copper solution reacts with peptide bound in the protein molecule producing a violet color which is directly proportional to the amount of protein present in the sample. Procedure: Three (3) clean test tube was label as 'test', 'standard' and 'blank', then 2ml of Biuret reagent was be added to each of them, thereafter, 0.02ml of serum was added to tube label as 'test' and 0.02ml of standard (multisera standard protein solution) was added to tube label as 'standard'. The 0.02ml of distilled water was added to blank. The mixture in each test tube was then incubated at 37°C for 10min and the absorbance was read at 550nm.

Determination of Serum Albumin: Principle: The measurement of serum albumin is based on its quantitative binding to the indicator 3,3',5,5'-tetrabromo-m-cresol sulphonaphthalein (Bromocresol Green, BCG). The albumin-BCG-complex absorbs maximally at 578nm and the absorbance is directly proportional to the concentration of albumin in the sample. Reagent: A reagent kit containing succinate buffer (75mmol/l; pH 4.2), bromocresol green (0.15g). Tris buffer (100mmol/l. pH 7.3) was used. Procedure: Three (3) clean test tubes was label as 'test', 'standard' and 'blank', then 0.01ml each of

distilled water, standard solution and serum sample was added to the tube label "blank", "standard" and "test" respectively. After that, 3ml of BCG reagent was added to each of the test tubes and then mixed properly. Each of the mixtures was incubated for 5min at room temperature. The absorbance of the test and standard was read against the reagent blank at 630nm using a spectrophotometer.

Data Analysis: Data analysis was generated and expressed as means and standard deviation (SD). Significance difference was consider as ($P > 0.05$) and SPSS package was used to separate the means by Duncan multiple range test.

RESULTS AND DISCUSSION

The biochemical parameters investigated showed that the result for URE was significantly different ($P < 0.05$) between T₂ (2.70g/dl) and T₄ (1.50g/dl). Contrarily, the result of creatinine (CRT) shows that there was significant difference ($P < 0.05$) in the values recorded across the treatments. The values for alkaline phosphate (ALP) shows there were no significant difference ($P > 0.05$) among the treatments. The result for aspartate amino transferase (AST) sows that there was significant difference ($P < 0.05$) between T₂ (6.66 μ l/l) and T₃ (3.33 μ l/l) Alanine amino transferase (ALT) also shows that there were significant difference ($P < 0.05$) between the T₂ (9.00 μ l/l) and T₃ (5.33 μ l/l).

The value obtained for (URE) in this study were higher than the finding of Maidala, and Abdullahi, (2021) who reported (00.01.00g/d) for (URE) for broilers fed neem and Guiera selegalensis leaf. However the values for (URE) obtained in this present study were within the range reported by Iyayi, (2021). High level of urea is associated with kidney impairment and high protein breakdown. (Emadi and Kermanshahi, 2022).

The value of creatinine (CRT) in this study was higher than the value 0.42-083 mg/dl

reported by Aikphanyi and Egweh (2020) for broilers fed neem and *Guiera senegalensis* leaf. Although the value obtained in the present study were within the range report by Maidala and Abdullahi, (2021). The high value obtained in this study may be attributed to the fact that protein level is maintained by critical homeostatic mechanisms that depend on the stage of growth, feed consumption, productivity, an environmental change (Platel and Crivivasan, 2022). The value for alkaline phosphatase (ALP) in this study were lower than the finding of Alkpitanyi and Egweh (2020) who reported 137.7-309.00 μ l for the alkaline phosphatase (ALP) for broilers fed ginger and black pepper. However, the value for alkaline phosphatase (ALP) in all the treatments obtained in this research were within the range (10.20 μ l/l) reported by (Lumeij, 2019). Higher serum levels of alkaline phosphatase (AIP) are observed when there is increased osteoblastic activity, involving the formation of mineralization of bone associated skeletal growth (Lumeij, 2019).

The value for aspartate amino transferase (ALT) in this study were lower than the finding of Maidala and Abdullahi (2021) who reported 21.40 - 27.52 μ l/l for aspartate amino transferase of broiler birds fed ginger and *Guiera sengalensis* leaf. However, the value for aspartate amino transferase obtained in this research was within the range reported by Osho et al. (2020) for broiler chickens. The activities of aspartate amino transferase (AST) in the blood are both indicator of liver function and damage. Increased levels of these enzymes are associated with liver or muscle stress (Lumeij. 2019).

The value obtained for alanine amino transferase (ALT) in this research were lower than the finding of Aikpitanyi and Egweh (2020) who reported 65.0-84.13iul for alanine amino transferase (ALT) for broilers fed

ginger and black pepper. However, the values obtained were within the range reported by Aidin and Navid (2023). The reduction in Alanine amino transferase (ALT) is an indication of better liver function. This is however contrary to the finding of a study of effect of turmeric rhizome powder on activity of some blood enzymes in broiler chicken (Emadi and Kermanshahi, 2022). The value for total protein (TP) in this study is higher than the findings of Adewale et al. (2023) who reported 3.07-3.40g/dl for total protein (TP) of broilers fed varying level of biscuit waste meal.

However the level for total protein obtained in this study were within the normal range 3.00-21.2 reported by Maidala and Abdullahi, (2021) the increased in the total protein (TP) is an indication of nutritional adequacy of the dietary protein in this experiment. The value for albumin (ALB) in this research was higher than the findings of Aikpitanyi and Egweh who reported 1.45-1.4g/di for albumin (ALB) for broiler birds fed ginger and black pepper. however, the values for albumin (ALB) obtained were within the normal range as reported by Farugia, (2020) serum albumin produced from liver and forms a proportion of plasma protein low Albumin may be casted by liver disease, malnutrition, late pregnancy, genetic variation. High Albumin is caused by dehydration (Farugia, 2020).

CONCLUSION

Based on the result obtained using *Vernonia amygdalina* and *Guiera senegalensis* leaf as phytogetic feed additives had no adverse effect on biochemical parameters of broilers. Therefore from the finding of this study, it is recommended that antibiotic growth promoters can be replaced with *Vernonia amygdalina* and *Guiera senegalensis* leaf in broilers diets without any effects on their biochemical parameters. It is also recommended that the hematological

parameters and carcass analysis should be carried out on birds fed *Vernonia amygdalina* and *Guiera senegalensis* leaf.

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TABLES

Table 1: Basal diets for starter phase

Ingredients	T ₁ 0%VA/GS)	T ₂ (0.1%VA)	T ₃ (0.1%GS)	T ₄ (0.1%VA & GS)
Maize	43.0	43.0	43.0	43.0
SBM	40.0	40.0	40.0	40.0
Wheat Offal	10.0	10.0	10.0	10.0
Fish Meal	2.00	2.00	2.00	2.00
Bone Meal	4.00	4.00	4.00	4.00
Premix	0.30	0.30	0.30	0.30
Salt	0.20	0.20	0.20	0.20
Lysine	0.20	0.20	0.20	0.20
Methionine	0.30	0.30	0.30	0.30
Total	100	100	100	100
Calculated Chemical Composition	Calculated Chemical Composition	Calculated Chemical Composition	Calculated Chemical Composition	Calculated Chemical Composition
Energy (kcal/kg)	386gMEKca/kg			
Crude Protein (%)	24%			
Calcium (%)	1.7%			
Phosphorus (%)	1.0%			

Table 2: Basal diets for finisher phase

Ingredients	T ₁ 0%VA/GS)	T ₂ (0.1%VA)	T ₃ (0.1%GS)	T ₄ (0.1%VA & GS)
Maize	59.00	59.00	59.00	59.00
SBM	22.0	22.0	22.0	22.0
Wheat Offal	10.0	10.0	10.0	10.0
Fish Meal	2.6	2.6	2.6	2.6
Bone Meal	3.04	3.04	3.04	3.04
Blood Meal	2.00	2.00	2.00	2.00
Premix	3.04	3.04	3.04	3.04
Salt	0.03	0.03	0.03	0.03
Lysine	0.02	0.02	0.02	0.02
Methionine	0.03	0.03	0.03	0.03
Total	100	100	100	100
Calculated Chemical Composition	Calculated Chemical Composition	Calculated Chemical Composition	Calculated Chemical Composition	Calculated Chemical Composition
Energy (kcal/kg)	3032MEKca/kg			
Crude Protein (%)	19.8%			
Calcium (%)	1.50%			
Phosphorus (%)	0.50%			

Table 3: Biochemical parameters of broilers fed *Vernonia amygdalina* and *Guiera senegaensis* as phytogenic feed additives

Parameter	T₁ (0%VAL/GSL)	T₂ (0.1%VAL)	T₃ (0.1%GSL)	T₄ (0.1%VAL/GSL)	SEM±
URA (g/dl)	1.76	2.70	1.90	1.50	0.16
CRT (mg/dl)	0.43	0.63	1.90	1.21	0.20
ALP (g/dl)	57.66	55.33	59.63	55.33	0.82
AST (lμ/l)	5.33	6.66	3.33	4.66	0.46
ALT (lμ/l)	7.33	9.00	5.33	8.00	0.46
TP (g/dl)	58.66	59.66	59.00	59.66	0.27
ALB (g/dl)	33.66	35.60	33.33	32.66	0.33