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SERUM BIOCHEMICAL PARAMETERS OF BROILER CHICKENS FED MIXTURE OF TURMERIC AND NEGRO PEPPER MEAL

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ABSTRACT

The study was conducted to evaluate the effect of Turmeric and Negro pepper mixture on serum biochemistry of broiler chicks for 48 days. A total of ninety six day old Arbor acre chicks were used for the experiment. The birds were randomly assigned to four treatment groups with eight birds constituting a replicate in a completely randomized design. The milled Turmeric and Negro pepper were mixed in the ratio of 50:50 (50%) and used in the formulation of Turmeric and Negro pepper mixture (TNPM) containing diets. The birds were fed four experimental diets designated as T_1, T_2, T_3, and T_4, formulated to contain 0.00, 0.50, 1.00, and 1.50% levels of TNPM at starter phase and 0.00, 1.50, 3.00, and 4.50% levels at finishing phase. Blood samples were collected from the wing vein at the 24th and 48th days of the experiment, which were evaluated for their serum biochemical constituents. At starter phase, total protein, albumin, uric acid and cholesterol concentrations were reduced significantly ($p<0.05$) in T_4. Alkaline phosphatase value was significantly ($p<0.05$) lowered in T_3. At the finishing phase, total protein and cholesterol values were higher ($p<0.05$) in the control (T_1). Albumin was higher ($p<0.05$) in T_1 and T_2. Globulin produced significantly ($p<0.05$) lower value in T_2. Aspartate amino transferase produced significantly ($p<0.05$) higher value in T_2. It was concluded that up to 4.50% of TNPM at finishing phase could be included in broiler diets without any detrimental effect on serum biochemical constituents.

Keywords: Turmeric, Negro pepper, phytogenics, blood, poultry, broilers

INTRODUCTION

Phytogenic products have been used for many decades as spices, herbs, ethno-veterinary, and its derived products.Their use in the feed industry is relatively recent. Following the European Union ban on antibiotic growth promoters in the animal feed industry in 2006, phytogenic plant parts have gained much interest as feed additives. Alternative ingredients and methods for the promotion of animal growth and the prevention of diseases were explored, with increased attention being paid to phytogenic and herbal products as they have gained greater market acceptance as natural additives. Jin (2010) characterized Phytogenic feed additives to have natural properties, multiple functions, side effect reduction, no resistance and residues. Among the phytogenic products commonly used in Nigeria are turmeric, Negro pepper (*Xylopia aethiopica*), ginger, garlic, *Moringa oleifera*, *Annona muricata*, Pawpaw (*Carica papaya*), *Bryophyllum pinnatum*, *Nauclea latifolia*, *Gmelina arborea* etc.

MATERIALS AND METHODS

The experiment was carried out at the Poultry Unit, Federal College of Agriculture, Ishiagu, Ebonyi State, Nigeria. Fresh turmeric (*Curcuma longa*) tubers were sourced from National Root Crop Research Institute (NRCRI), Umudike, Ikwuano L.G. A., Abia State, Nigeria. The turmeric tubers were washed properly and sundried to 15% moisture, while the ripped Negro pepper (*Xylopia aethiopica*) fruits were procured from Akwete market Enugu, Enugu State, Nigeria and were also washed properly and sundried to 15% moisture. These materials were subsequently milled differently using harmer mill. The milled turmeric and Negro pepper were mixed in the ratio 50:50 (50%) each to have Turmeric and Negro pepper mixture (TNPM).

Four experimental diets designated as T_1, T_2, T_3, and T_4 where formulated to contain 0.00, 0.50, 1.00, and 1.50 levels of TNPM at starter phase and 0.00, 1.50, 3.00, and 4.50 levels at finisher phase. The compositions of the experimental diets are given in Table 1 and Table 2.

Table 1: Percentage composition of the experimental diets for starter broilers.

Ingredient	T_1	T_2	T_3	T_4
Maize	50.00	50.00	50.00	50.00
Soya bean meal	16.00	16.00	16.00	16.00
Groundnut cake	20.00	20.00	20.00	20.00
Wheat offal	8.00	7.50	7.00	6.50
Negro pepper/Turmeric	0.00	0.50	1.00	1.50
Fish meal	2.00	2.00	2.00	2.00
Limestone	1.50	1.50	1.50	1.50
Bone meal	1.50	1.50	1.50	1.50
Salt	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25
Total	100	100	100	100

Table 2: Percentage composition of the experimental diets for finisher broilers.

Ingredient	T1	T2	T3	T4
Maize	50.00	50.00	50.00	50.00
Soya bean meal	16.00	16.00	16.00	16.00
Groundnut cake	12.00	12.00	12.00	12.00
Wheat offal	16.00	14.50	13.00	11.50
Negro pepper/Turmeric mixture	0.00	1.50	3.00	4.50
Fish meal	2.00	2.00	2.00	2.00
Limestone	1.50	1.50	1.50	1.50
Bone meal	1.50	1.50	1.50	1.50
Salt	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25
Total	100	100	100	100

Ninety six day old Arbor acre chicks were sourced from Chi farms® in Ibadan, Oyo state, Nigeria. They were randomly assigned to 4 experimental treatment groups, each replicated 3 times with 8 birds constituting a replicate. The birds were assigned the four experimental diets in a Completely Randomized Design (CRD) and fed the experimental diets in two phases of 24 days each given a total of 48 days feeding trial. Each replicate were confined in a poultry house whose demarcations between pens were covered with wire gauze. The concrete floored pens were covered with wood shavings as litter material. Before the arrival of the day old chicks, the brooding house was washed and disinfected and allowed to dry. The brooder house was pre-heated for 6-12hrs to enable it reach the normal temperature (32ºc) required by day old chicks. Fresh feed and water was provided *ad libitum* in the mornings (8:00 hr) on daily basis. Heat and light was provided for the first 14 days using stoves and electric bulbs. The birds were vaccinated against infectious bursal (Gumboro) disease at days 10 and 24 respectively, while the NDV - Lasota vaccine was given on day 1, 14 and 28 to protect against New Castle Disease.

Blood samples (2.5ml) were drawn from one bird per replicate on the 24th and 48th day of the experiment. The birds were bled through the marginal wing vein. The blood samples were collected over anti-

coagulant free bottle. The samples were allowed to clot at room temperature and serum separated by centrifuging within three hours of collection.

Data obtained were analyzed using one way analysis of variance (ANOVA) as described by SAS (2008). Significant (P<0.05) means were separated using the Duncan Multiple New Range Test.

RESULTS AND DISCUSSION

The effect of Turmeric and Negro pepper mixture containing diets on serum biochemistry of broiler starter is presented in Table 3. Total protein, albumen, uric acid, cholesterol and Alkaline phosphatase (ALP) showed significant differences across the treatments. T_4 showed significantly ($p<0.05$) lower total protein value. The lower total protein in T_4 may indicate poor utilization of dietary protein. The values are perhaps in agreement with 2.38 - 5.22 g/dl recorded by Meluzzi *et al.* (1992) for apparently healthy broilers. T_1 (2.69 g/dl) recorded the highest value for albumin which is in agreement with 1.17 to 2.74 g/dl reported by Meluzzi *et al*. (1992) for apparently healthy broilers. No significant difference ($P>0.05$) was observed for globulin but the highest value was recorded for T_4 (1.87 g/dl). This implies that the immunity of the broilers was not compromised and the value was numerically improved at T_4. From this study, birds fed T_1 diet had better total protein, globulin and albumin than the other dietary groups for serum protein during the starter phase, this is in agreement with the findings of Adegoke *et al*. (2018) but disagrees with the findings of Aikpitanyi and Egweh (2020). The uric acid concentration differed significantly ($p<0.05$) and fell within the normal physiological values of 1.9 - 12.5 mg/dl reported by **C**linical Diagnostic Division (1990). The significant value reported for the treatment groups (T_2, T_3 and T_4) may suggest better utilization of protein and amino acid. The result can further suggest efficient renal and hepatic function (Jiwuba *et al*., 2020). The findings of this study reveals that the TNPM caused a significant reduction in the levels of serum cholesterol, which is in agreement with the reports of Aikpitanyi and Egweh (2020). The significant reduction in serum cholesterol concentration of broilers fed TNPM diets may suggest a general decline in lipid mobilization, hence supported the reduction and deposition of cholesterol in the muscle. The non-significant effect reported in this study for AST and ALT and the significantly ($p<0.05$) lower concentration of ALP for T_3 and T_4 may indicate better liver function among the birds.

Table 3. Effect of turmeric and Negro pepper mixture supplement diets on serum chemistry of broiler starter.

	Dietary levels				
Parameters (%)	T_1	T_2	T_3	T_4	SEM
Total protein (g/dl)	4.53^{a}	4.17^{ab}	3.66^{b}	3.05^{c}	0.21
Albumin (g/dl)	2.69^{a}	2.56^{ab}	2.11^{b}	1.18^{c}	0.37
Globulin (g/dl)	1.84	1.61	1.55	1.87	0.45
Urea (mg/dl)	9.52^{a}	6.83^{ab}	4.76^{b}	2.31^{c}	2.74
Creatinine (mmol/L)	48.98	49.07	47.65	48.87	1.15
Cholesterol (mg/dl)	153.3^{a}	144.3^{ab}	124.5^{b}	117.36^{c}	3.84
AST (U/L)	123.09	120.94	121.85	122.54	3.63
ALT (U/L)	26.84	28.37	28.04	29.51	0.98
ALP (U/L)	48.18^{ab}	49.72^{a}	47.29^{c}	47.65^{b}	1.14

$^{a-c}$ means on the same row with different subscript are significantly different ($P < 0.05$); Aspartate amino transferase (AST); Alkaline phosphatase (ALP); Alanine amino transferase (ALT)

The effect of turmeric and Negro pepper mixture containing diets on serum chemistry of finishing broiler is presented in Table 4. The Total protein, albumin, globulin, cholesterol and Aspartate Transaminase (AST) were significantly ($p<0.05$) influenced by the experimental diets. T_1 had significant ($p<0.05$) increase in total protein in comparison to the other groups. They were within normal physiological range of 3.0-4.9 mg/dl reported by Clinical Diagnostic Division (1990) for apparently healthy birds. The results of this investigation, which ranged from 2.03 to 2.62 g/dl, were similar to those published by Meluzzi *et al.* (1992) for apparently healthy broilers, which ranged from 1.17 to 2.74 g/dl. The fact that albumin concentrations are within normal physiological ranges suggests that the liver and other extra hepatic

organs involved in protein synthesis are in good condition. Serum albumin and globulin depend on availability of dietary protein. Globulin values of 1.40 mg/dl to 1.81 mg/dl fell within the reference range of 0.5 to 1.8 mg/dl reported by Thrall (2007).The cholesterol of finishing broilers fed Turmeric and Negro pepper mixture containing diets showed significant decrease with increasing levels of the phytogenic feed additives. However, the cholesterol was within the reported range of 52.00 - 148.00 mg/dL by Mitruka and Rawnsley (1977). This suggests that turmeric and Negro pepper in the treatment diets may promote liver and vascular function by increasing cholesterol transfer to the liver. The AST levels obtained in this experiment are within the normal range of 70- 220U/l reported by Meluzzi *et al.* (1992).

Table 4. Effect of turmeric and Negro pepper mixture supplement diets on the serum biochemistry of finisher broiler.

	Dietary levels				
Parameters (%)	T_1	T_2	T_3	T_4	SEM
Total protein (mg/dl)	4.49^{a}	4.02^{b}	3.90^{b}	3.87^{b}	0.89
Albumin (mg/dl)	2.61^{a}	2.62^{a}	2.03^{b}	2.06^{b}	0.66
Globulin (mg/dl)	1.88^{a}	1.40^{b}	1.87^{a}	1.81^{a}	0.4
Urea (mmol/L)	20.47	20.61	20.39	20.10	0.13
Creatinine (mmol/L)	49.81	50.39	49.19	51.11	0.01
Cholesterol (mg/dl)	124.92^{a}	93.53^{b}	88.56^{bc}	85.18^{c}	6.01
AST (U/L)	48.77^{b}	51.37^{a}	47.55^{bc}	46.59^{c}	0.70
ALT (U/L)	61.40	62.94	61.45	66.46	1.10
ALP (U/L)	78.58	77.25	78.39	77.88	1.03

$^{a-c}$ means on the same row with different subscript are significantly different ($P < 0.05$); Aspartate aminotransferase (AST); Alkaline phosphatase (ALP); Alanine amino transferase (ALT)

CONCLUSION

Blood parameters can be used to determine the response of chickens to hazardous substances as well as organ function. It is well known that birds with a healthy (normal) blood composition are more likely to perform well. The results showed that inclusion of Turmeric and Negro pepper up to 1.5% and 4.5% levels at starter and finisher phases respectively produced no deleterious effect on serum constituents of the broilers.

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