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(Short Communication)
Effects of graded levels of Turmeric *(Curcuma longa)* meal on the Serum metabolites of growing Rabbits

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Target Audience: Nutritionists, Veterinarians, Feed millers

Abstract

A 90-day experiment was conducted using a total of twenty-four unsexed growing rabbits to investigate the influence of feeding graded levels of turmeric meal as an additive on their metabolites. The rabbits were randomly assigned to four dietary treatments ($T_1 – T_4$) with six animals per treatment and three replicates in a Completely Randomized Design (CRD). The turmeric was incorporated in graded levels of 0g, 0.5g, 0.7g and 0.9g per kg feed in T_1, T_2, T_3 and T_4 respectively. Serum metabolite parameters evaluated were Urea, Creatinine, Glucose, Total Protein, Albumin, Total bilirubin, Conjugated bilirubin and Cholesterol. Significant differences ($P < 0.05$) were observed with respect to treatment effects on creatinine, glucose, urea, cholesterol, conjugated bilirubin, total bilirubin, albumin and total protein. Turmeric as feed additive has beneficial effects on serum metabolites of growing rabbits and it is recommended that up to 0.9gturmeric/kg diet should be added in rabbit diet without adverse effect on health status.

Keywords: Turmeric, serum metabolites and growing rabbits

Description of Problem

Feed is an important input for any livestock business and this is not an exception in rabbit farming business. Feed additives of plants origin are generally considered to be safer, healthier and less hazardous to the animals. Herbs and herbal products are being incorporated into livestock feeds as feed additives because of the beneficial effects of these herbal substances in animal nutrition, such as the improvement of the digestive enzymes secretion, activation of immune response and antioxidant response (1) Phytogenic feed additive is defined as plant derived substances incorporated into the diets of livestock to improve productivity in terms of animals performance (2). More recently, these phytogenic plants have also been used in feeds as natural antibiotics.

It has been traditionally accepted that turmeric is a potent antioxidant and anti-inflammatory agent (3). It is a rhizome and perennial herb of the ginger family Zingiberaceae. It is a native plant of South East Asia and requires temperatures between 20^{o}C and 30^{o}C with a considerable amount of annual rainfall to thrive. It can improve digestion and nutrient metabolism of animals and its effects on animal metabolism is due to the curcumin content in its rhizome (4).

Blood biochemistry parameters and metabolites activity are important biomarkers of the health status and nutrient metabolism in the body of an organism (5). Some research works on turmeric studies have evaluated the effects of turmeric meal on blood biochemistry parameters and antioxidant capacity in broiler chicken (6). It has been used in recent time as feed additive in rabbit production and among rabbit farmers, hence there is need to determine the effect of turmeric (*Curcuma longa*) on the metabolites of growing rabbits.

Materials and Methods

The experiment was conducted at the Faculty of Agriculture, Research and Demonstration Farm, University of Port Harcourt.

Fresh and tender turmeric rhizomes were harvested, washed and sun-dried for three days, until they were completely dried. They were peeled and milled to form turmeric meal. The turmeric meal was incorporated in graded levels of 0g, 0.5g, 0.7g and 0.9g per kg feed in Treatments T_1, T_2, T_3 and T_4 respectively (Table 1). A total of twenty-four growing rabbits with average weights of 1.8kg were used. The rabbits were housed in a wire cage constructed and designed to enable easy collection and weighing of animals. The rabbits were given water *ad-libitum* and were fed daily. The rabbits were randomly selected, weighed to get their initial weights and allocated to four dietary treatment groups which were represented as T_1, T_2, T_3, T_4. Each treatment group was further subdivided into three replicate of two (2) rabbits each in a completely randomised design (CRD). The rabbits were assigned to 0g, 0.5g, 0.7g and 0.9g per kg feed in Treatments T_1, T_2, T_3 and T_4 respectively. All routine management pactice and vaccination were maintained. Feed and water were offered *ad libitum.* At the end of the 90 days feeding trial, two rabbits were randomly selected from each replicate group for blood samples. The metabolites: urea, creatinine, glucose, total protein, albumin, total bilirubin, conjugated bilirubin and cholesterol were determined as described by (7)

All data obtained were subjected to the analysis of Variance (ANOVA) according to (8) and their means separated using Duncan Multiple Range Test (DMRT) according to (9) using the Statistical Package for Social Science (SPSS) software.

Results and Discussion

The results of the effect of turmeric meal on the metabolites of growing rabbits are shown in Table 1. Significant differences ($P<0.05$) were observed in conjugated bilirubin, total bilirubin creatinine, glucose, urea, total protein and cholesterol of rabbits fed turmeric based diets.

A rise in the serum level of these metabolites is a good indicator of the inability of the kidney to excrete these products, therefore this can result in a decrease in glomerular filtration rate (10). The serum concentrations of urea and creatinine could also give an insight into the effect of a compound on the tubular and on the glomerular part of the kidney (11). Decline in glomerular filtration is caused by renal failure (12).

Bilirubin is the major breakdown product that results from the destruction of old red blood cells. It is excreted from the body by the liver, hence, also a good indicator of the function of the liver (13).Total bilirubin is a toxic metabolite and it decreased with increased concentration of turmeric between the treatments. This suggests that there may not be any issue of liver dysfunction, and thus growing rabbits can tolerate turmeric levels up to 0.9% without any deleterious effects on the liver function for 10 weeks thereby supporting the assertion by (4)) stating that toxic effect of turmeric seems to be dependent on the animal species and duration of treatment.

Blood glucose is a sensitive indicator of environment stress (14). There was an increase in blood glucose concentration, though falls within normal range for rabbit (15).

Total proteins and Albumin also had significant difference between the treatments and it did not follow pattern. The result corroborate the report of (16) which is further supported by (3) who reported that turmeric is a potent anti-oxidant and anti-inflammatory agent in animal body system.The result showed a drop in cholesterol in treatment 4 when compared to the treatment 1 similar to observation of (17).

Conclusion and Application

1. Turmeric as feed additive has beneficial effects on serum metabolites growing rabbits
2. It is recommended that up 0.9g turmeric /kg diet should be added in rabbit diet for improved performance.

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Table 1: Experimental Diets (kg)

Feed ingredient	T_1	T_2	T_3	T_4
Yellow maize	28.15	28.15	28.15	28.15
Wheat bran	25.00	25.00	25.00	25.00
Groundnut cake	15.00	15.00	15.00	15.00
Palm kernel cake	28.00	27.50	27.30	27.10
Vit/Min/Premix	0.25	0.25	0.25	0.25
Di methionine	0.10	0.10	0.10	0.10
Salt	0.40	0.40	0.40	0.40
Lysine	0.10	0.10	0.10	0.10
Turmeric	0.00	0.50	0.70	0.90
Bone meal	3.00	3.00	3.00	3.00
TOTAL	**100**	**100**	**100**	**100**

Table 2: The Effects of Turmeric Meal (*Curcuma Longa*) On the Metabolites of Growing Rabbits

TREATMENT METABOLITES	T_1	T_2	T_3	T_4
Urea (mmol/L)	2.65 ± 0.01^{b}	3.85 ± 0.27^{a}	4.13 ± 0.69^{a}	2.65 ± 0.17^{b}
Creatinine (mmol/L)	159.50 ± 0.89^{b}	162.17 ± 5.01^{ab}	155.50 ± 5.25^{b}	169.50 ± 13.23^{a}
Glucose (mmol/L)	6.30 ± 0.12^{c}	6.65 ± 0.21^{b}	$6.40b \pm 0.46^{c}$	10.85 ± 1.23^{a}
Total protein (g/L)	59.00 ± 0.73^{c}	61.50 ± 0.62^{b}	56.50 ± 0.89^{d}	66.50 ± 3.05^{a}
Albumin (g/L)	39.50 ± 0.62^{a}	39.83 ± 0.87^{a}	41.50 ± 0.62^{a}	41.00 ± 1.41^{a}
Total bilirubin (µmol/L)	15.75 ± 0.43^{a}	15.70 ± 1.26^{a}	12.05 ± 0.41^{b}	10.20 ± 0.41^{c}
Conjugated bilirubin (µmol/L)	8.10 ± 0.72^{b}	8.90 ± 1.48^{a}	8.10 ± 0.72^{b}	5.70 ± 0.37^{c}
Cholesterol (mmol/L)	2.40 ± 0.16^{a}	3.15 ± 0.26^{b}	2.15 ± 0.17^{a}	2.45 ± 0.13^{a}

^{abc} within column, means ± SEM with different superscript(s) differ significantly ($P<0.05$)