EFFECT OF SUPPLEMENTING MAHOGANY (*Khaya senegalensis*) BARK AQUEOUS EXTRACT ON CAECUM MICROBIOTA OF BROILER CHICKENS IN THE SEMI-ARID ZONE, NIGERIA

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ABSTRACT
The study was conducted to investigate the effect of supplementing aqueous mahogany (Khaya senegalensis) bark extract (AMBE) on the caecum microbiota of broiler chickens in the semi-arid zone in Nigeria. A total of two hundred (200) day old broiler chicks (mixed-sex) were used for the study. The chicks were randomly allotted to five (5) dietary treatments which was replicated four (4) times with each replicate having ten (10) birds in a completely randomized design (CRD). Treatment 1 (T_1); control group were fed diets containing 0.00 ml/L of AMBE while treatment 2(T_2,) treatment 3(T_3), treatment (T_4) and treatment (T_5) were fed 12.50, 25.00, 37.50 and 50.00 ml/L respectively. The experiment lasted for 8 weeks and data on caecum microbiota were collected and subjected to analysis of variance. The result on total microbial count showed significant ($P<0.05$) difference among the treatment groups. There were significant ($P<0.05$) differences observed among treatment groups for Escherichia coli, Streptococcus aureus, Streptococcus faecalis, Proteus mirabilis and Bacterial species. The presence of bacterial population increased with increased in AMBE concentration. In conclusion, supplementing broiler chickens drinking water with aqueous mahogany bark extract encouraged the growth of bacterial population.

Keywords: Mahogany, caecum, microbial, population and broilers

DESCRIPTION OF PROBLEM

The ban on the use of antibiotic growth promoters in poultry production is gaining prominent attention. The European Union and the US made a bold move by banning the use of antibiotics as growth promoters in animal agriculture in 2006 and 2017, respectively [1]. This move has sparked a growing interest in exploring alternative solutions to the use of synthetic additives to enhance growth performance and also maintaining the health status of poultry and other livestock.

Plants has gained attention for their antibiotic and anti-inflammatory properties, attributed to their diverse secondary metabolites with various biological effects [2]. These secondary metabolites can help in improving animal health thereby reducing the need for antibiotics use. Notably, mahogany extract has demonstrated an anti-inflammatory, antimicrobial, and antioxidant properties [3].

The caeca is often chosen as a site for investigation of the gut microbiota due to the important role it plays in both metabolism and immune maturation. Digestive caecal processes such as bacterial fermentation plays an important role in the production of short chain fatty acids and provide up to 10% of a chicken's metabolizable energy [4]. Hence, the objective of this study was to investigate the effect of mahogany (*Khaya senegalensis*) bark aqueous extract on caecum microbiota of broiler chickens.

MATERIALS AND METHOD

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

Source of test material and preparation of the extract: Mahogany bark was obtained within the University of Maiduguri premises. The bark was harvested, washed with water, cut into small pieces and allow to dry for 3 – 5 days under room temperature. After drying, Mahogany bark was ground into fine particles and 100g was soaked in 1 liter of water for 12 hours. The mixture was then filtered to separate the debris from the liquid extract.

Experimental design and management of birds: Two hundred (200) day-old Arbor Acre broiler chicks (mixed-sex) were used for the study. The chicks were randomly allotted to five (5) dietary treatments which was replicated four (4) times with each replicate having ten (10) birds in a completely randomized design *(CRD).* Treatment 1 was the control with inclusion of 0.00 ml/l of AMBE while treatments 2, 3, 4 and 5 were given 12.50, 25.00, 37.50 and 50.00 ml per litre of aqueous mahogany bark extract respectively. Commercial starter diet was used for the first week of brooding then the formulated broiler starter diet as shown in Table 1 was used for three weeks, while the broiler finisher diet as also shown in Table 1 was used for the remaining four weeks of the experiment. Feed and water were given *ad libitum* throughout the period of the experiment.

Table 1: Ingredient Composition and Calculated Analysis of the Experimental Diets

Ingredients (%)	Broiler Starter (%)	Broiler Finisher (%)
Maize	49.50	54.90
Wheat Offal	10.50	11.00
Groundnut Cake	18.90	14.00
Soya Bean Meal	12.00	11.00
Fish Meal	6.00	5.00
Bone Meal	2.00	3.00
Common Salt	0.30	0.30
Premix	0.25	0.25
Methionine	0.30	0.30
Lysine	0.25	0.25
Total	**100**	**100**
Calculated Analysis		
ME (Kcal/kg)	2988.52	2993.33
Crude Protein (%)	22.40	20.06
Crude Fibre (%)	3.79	3.61
Ether Extract (%)	6.07	5.77
Lysine (%)	1.38	1.24
Methionine (%)	0.68	0.65
Calcium (%)	1.18	1.48
Phosphorus (%)	0.67	0.78

Composition of premix per kg of diet: vitamin A (270,000 i.u); vitamin B3 (38,000 i.u); vitamin E (300mg); vitamin K (200 mg); vitamin B1 (25 mg); vitamin B2 (80 mg); vitamin B6 (40 mg); vitamin B12 (0.2 mg); calcium pantothenate (100 mg); choline (300 mg); DL methionine (30 g); lysine (10 g); calcium (200 g); phosphorus (50 g); sodium (16 g); iron (700 mg); zinc (800 mg); manganese (1300 mg); cobalt (5 mg); iodine (5 mg).

Data collection: Caecum from 20 broiler chickens (one from each replicate) were collected during carcass analysis and sent to the Department of Animal Science Laboratory for microbial count.

Statistical Analysis: All data collected were subjected to analysis of variance (ANOVA) using [5] and significant difference among means were separated using [6].

RESULTS AND DISCUSSION

The results for caecum microbiota is shown in Table 2. There was significant ($P<0.05$) difference among the treatment groups for total bacterial count. The bacterial population increase across the treatments with the exception of T_3 (23.00×10^4 cfu)) which had the lowest total bacterial count. According *to the report of* [7], medicinal plant extract increase the number of lactic acid bacteria in intestinal gut and decrease total bacterial number in the caecum. *Escherichia coli* also showed significant ($P<0.05$) difference among the treatment groups with T_4 (54.00)

having the highest count. The findings from this study revealed that AMBE encouraged the multiplication of *E. coli* with increase in the concentration of extract. This study is similar to the findings of [8] but varies with the work of [9].

Staphylococcus aureus and *Streptococcus faecalis* showed similar pattern of increase in bacterial population with increase in the concentration of the extract which agrees with the findings of [10]. *Proteus mirabilis* had the least bacterial presence compared to the other bacteria with T_1 (0.00 ml/L), T_2 (12.50 ml/L) and T_3 (25.00 ml/L) revealing total absence. This study agrees with the normal range of growth reported by [11] however varies with the result of [12]. Aqueous mahogany bark extract encouraged the growth and multiplication of bacterial population which aids fermentation within the ceacum of broiler chickens.

Table 2: Effect of Mahogany Bark Aqueous Extract on Caecum Microbiota of Broiler Chickens (2 – 8 weeks)

Parameters	Mahogany Bark Aqueous Extract (ml/L)					SEM
	T_1 (0.00)	T_2 (12.50)	T_3 (25.00)	T_4 (37.50)	T_5 (50.00)	
Total Bacterial Count (x 10^4 cfu)	29.00^{d}	53.00^{c}	23.00^{e}	98.00^{a}	79.00^{b}	0.92^{*}
Differential Count						
Escherichia coli (x 10^4 cfu)	20.00^{c}	33.00^{b}	17.00^{d}	54.00^{a}	53.00^{a}	0.53^{*}
Staphylococcus aureus (x 10^4 cfu)	1.00^{d}	5.00^{c}	0.00	11.00^{a}	7.00^{b}	0.48^{*}
Streptococcus faecalis (x 10^4 cfu)	3.00^{e}	11.00^{c}	6.00^{d}	18.00^{a}	13.00^{b}	0.41^{*}
Proteus mirabilis (x 10^4 cfu)	0.00	0.00	0.00	5.00^{a}	2.00^{b}	0.23^{*}
Bacillus species (x 10^4 cfu)	6.00^{b}	4.00^{c}	0.00	10.00^{a}	4.00^{c}	0.30^{*}

^{abcde}= Means in the same row bearing different superscripts differs significantly (P<0.05), * = Significant difference

CONCLUSION AND APPLICATION

The results from this study showed that supplementing broiler chickens drinking water with mahogany bark aqueous extract encouraged the multiplication of bacteria which aid in fermentation within the caecum of the birds.

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