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Erythrocytic indices of broilers treated with turmeric paste

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Abstract

Hematological indices of broilers treated with turmeric paste (TP) were assessed to determine whether the supplement, TP is safe or not. Hematological indices (PCV, HB, RBC, WBC, MCV, MCH, and MCHC) are indicators of the physiological status of animals and are used to monitor health or diagnose diseases. Sixty (60) day old broilers were randomly allocated into 2 groups namely group A: treated with 0.5 g/kg of turmeric paste and group B: untreated. There were significant differences in means of RBC (3.36; 3-30), WBC (200.33; 205.82), Platelets (198.44; 205.22) and MCHC (221.88; 228.77) between the TP treated group and the untreated (control) group respectively. The means of RBC were significantly higher ($p < 0.05$) while the means of WBC, platelets and MCHC were significantly lower ($p < 0.05$) in the treated group when compared to the untreated group. The hematological values obtained from this study did not vary significantly from the reference values indicating that feeding broilers with TP do not affect their health status.

Keywords: Broiler chicken, hematology, turmeric paste

Introduction

Hemogram is a group of medical laboratory tests/analysis that gives information on the cells in an animal's or a person's blood [1]. It can be used to monitor health or diagnose diseases. Hematology is the scientific study/analysis of the nature, functions, and diseases of the blood and shows pertinent information for diagnosis and disease in animals [2]. Hematological parameters are good indicators of the physiological status of animals and changes in them are valuable in assessing the response of such animals to various physiological situations [3]. Also, it is very useful in animal production as it is used to determine the health status, metabolic diseases, nutritional deficiencies and welfare of animals [4]. Incidence of diseases and malnutrition are diagnosed from the normal reference values of various haematological parameters measured based on the case under investigated.

It is reported that aromatic plants which are those plants that contain aromatic compounds mainly essential oils that are volatile at room temperature [5] may increase feed intake and may enhance secretion of endogenous digestive enzymes [6]. Turmeric rhizome (*Curcuma longa*) which is an aromatic tropical plant of the Zingiberaceae family, has an influence on growth performance in poultry. Curcumin is the active ingredient of *Curcuma longa*, and is widely used in Eastern societies [7]. Some studies have shown the health effects of turmeric such as anti-inflammatory [8] and antioxidant effects [9]. Furthermore, the use of turmeric in broiler diets has been shown to have antimicrobial activity on *E. coli* and coliform bacteria [10]. It is effective against protozoan parasites such as coccidiosis [11]. However, pharmacokinetic studies of *Curcuma longa* in animals demonstrated that about 40-85% of an oral dose of turmeric powder (curcumin) goes through the gastrointestinal tract unchanged [12, 13].

Black Pepper is a flowering vine that belongs to the family: Piperaceae, genus: piper, and specie: nigrum, rich in glutathione peroxidase and glucose-6-phosphate dehydrogenase [14]. Its antioxidant property has been shown [15]. It is naturally considered to be a hot, pungent herb that stimulates the digestive tract, by enhancing the secretion of fluids and circulation of blood in the gastrointestinal tract and so increases the absorption of selenium, vitamin B complex, curcumin (Turmeric), Beta carotene and other nutrients [16].

Piperine is the most active constituent of black Pepper and has been found to support the absorption of other herbs, curcumins found in Turmeric specifically. One study found that combining Turmeric and Black Pepper increased the bioavailability of Turmeric by 154% versus Turmeric alone [17], Piperine supports the inter-cellular permeability and uptake of curcumins [18].

Due to the poor absorption of turmeric powder in the gastrointestinal tract, the powder was turned into paste to enhance its absorption through the gastrointestinal tract of broilers. Turmeric paste is a mixture of turmeric powder (curcumin), black pepper (piperine) and oil in semi-solid form [11]. Hence, this study is to assess the health status of broilers treated with turmeric paste through their hematological indices.

Materials and Method

Experimental design

This research was carried out at the poultry unit of the research farm of the College of Veterinary Medicine, Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria. Sixty (60) day old broiler chicks vaccinated against Newcastle and Gumboro diseases were randomly assigned into two groups of 30 chicks each and reared in deep litter system. The group (A) was not treated with turmeric paste and this serves as the control while group (B) was treated with turmeric paste per os at 0.5 g/kg body weight from day two till the 5th week of their lives which is till they are 35 days old.

Preparation of turmeric paste

The turmeric paste was prepared with freshly prepared turmeric powder, freshly ground black pepper, water and virgin olive oil at the ratio of 60g of turmeric: 2 cups of water: 1 to 2 teaspoon of black pepper: 70 ml of extra virgin olive oil [19]. With this measurement, the mixture of turmeric and water were cooked for 10 minutes. Olive oil and black pepper were added at the end of the cooking. The golden paste was allowed to cool and appropriate dosages were calculated and given to the birds. It was stored in the refrigerator throughout the period of the experiment [11].

Sample collection/ analytical measurements

The birds were weighed weekly and at the end of the experiment, blood was collected through the wing veins using disposable syringes and needles from sampled birds (ten birds per treatment group). The blood samples (5 mls/ bird) were collected into sample bottles with di-potassium salt of ethylene diamine tetra acetic acid (EDTA) which served as anticoagulants for haematological analyses. Hematological parameters were estimated using standard procedures as

described by [20] for hemoglobin, red blood cells (RBC), packed cell volume (PCV), white blood cells (WBC) and platelets contents. The mean corpuscular haemoglobin and mean corpuscular volume were determined using appropriate formulae as described by [21].

Statistical analysis

The data collected were analysed using SPSS version 20 statistical package. All data were expressed as Means \pm Standard Error of Means (S.E.M). Students 't' test was used to compare the two groups which are turmeric paste and untreated (control). A least significant difference was dictated at 5% significance level.

Results and Discussion

The mean haematological parameters of broilers treated with 0.5g/kg of turmeric paste and the control were shown in Table 1. This result was compared with the normal reference range as reported by [22]. There were significant differences ($p < 0.05$) in means of RBC, WBC, Platelets and MCHC between the treated and untreated groups. The mean RBC of broilers (3.36; 3.30) treated with TP were significantly higher ($p < 0.05$) than the control and this corresponds with the reports of [23] indicating a significant increase in erythrocyte with turmeric meal inclusion in drinking water. Although in this study, turmeric paste was used and given orally. This suggests that turmeric enhances erythropoiesis in broilers. There were higher values/means of PCV, HB and MCH but not statistically significant in treated broilers when compared with the untreated broilers (control). This result is in concordance with the reports by [24] and [23] that the inclusion of turmeric in the feeds of broilers had no significant effect on hematocrit level and on hemoglobin concentration of broilers. These hematological parameters (PCV, HB, and MCH) are used in diagnosing anaemia and polycythemia in young birds [25] and their values were higher in the treated group in this study but they are still within their normal range thus indicating that turmeric paste is safe in broiler production. Means of WBC (200.33), platelets (198.44) and MCHC (221.88) of broilers treated with TP were significantly lower than the means of broilers not treated with TP (205.82, 205.22, and 228.77) respectively. This result corroborates the reports of [26] whereby white blood cell count reduced markedly after *Curcuma longa* extract supplementations thus suggesting that this supplement possesses some anti-inflammatory effects. Also, earlier research by [27] showed that treatment with curcumin reduced the proliferation of lymphocytes following the inductive action of interleukin-2 (IL-2). All the haematological values obtained from this study fall within the normal ranges as reported by [22].

Table 1: Mean haematological indices of broilers treated with turmeric paste and the control

Haematological parameter	No Turmeric paste (control)	Turmeric paste treated
PCV (%)	43.75 \pm 0.45	43.85 \pm 0.45
HB (g/d)	10.73 \pm 0.07	10.82 \pm 0.07
RBC ($\times 10^{12}$)	3.30 \pm 0.02 ^b	3.36 \pm 0.03 ^a
WBC ($\times 10^9$)	205.82 \pm 1.21 ^b	200.33 \pm 1.21 ^a
Platelets ($\times 10^9$)	205.22 \pm 9.37 ^a	198.44 \pm 9.37 ^b
MCV	113.33 \pm 0.44	112.34 \pm 0.44
MCH	45.74 \pm 0.35	46.44 \pm 0.35
MCHC	228.77 \pm 1.21 ^a	221.88 \pm 1.21 ^b

a, b = means on the same row with different Superscript is significantly different ($p < 0.05$); PCV = Packed cell volume, Hb = Hemoglobin, WBC = White Blood Cell, RBC = Red Blood Cell, MCV = Mean Corpuscular Volume, MCH = Mean Corpuscular Hemoglobin, MCHC = Mean Corpuscular Hemoglobin Concentration

Conclusion

It is concluded that turmeric paste is safe and could be fed to broilers without any detrimental effect on their health status.

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