Available online on 15.11.2020 at http://jddtonline.info

Journal of Drug Delivery and Therapeutics

Open Access to Pharmaceutical and Medical Research

Open Access Research Article

Effect of Aqueous Extract of *Thonningia sanguinea* on Blood Electrolytes of Broilers Chickens

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ABSTRACT

The aim of the present study is to evaluate the effect of aqueous extract of *Thonningia sanguinea* on blood electrolytes of broiler chickens. To do this, two hundred (200) 15-day-old Hubbard broiler chickens were divided into 2 batches of 100 chickens each. The chickens in the control group (Batch C) received unsupplemented water while those in the test group (Batch E) received water supplemented with 10 g / L of aqueous extract of *T. sanguinea* for one week. Then, the zootechnical parameters such as weight growth, weight gain, consumption index and the level of serum electrolytes were determined. The results of the study showed that the aqueous extract of *Thonningia sanguinea* improved weight growth, weight gain and consumption index. At the same time, the results also showed that *T. sanguinea* did not significantly ($p < 0.05$) affect the level of blood electrolytes of broilers chickens. From the results obtained in the present study, the aqueous extract of *Thonningia sanguinea* could be used to improve poultry productivity without damage on blood electrolytes.

Keywords: *Thonningia sanguinea*; chicken broilers; Blood electrolytes; Zootechnical parameters

Article Info: Received 29 Aug 2020; Review Completed 16 Oct 2020; Accepted 23 Oct 2020; Available online 15 Nov 2020

Cite this article as:

Konan KS, Moroh AJL, Tiekpa WJ, N'Guessan JD, Effect of Aqueous Extract of *Thonningia sanguinea* on Blood Electrolytes of Broilers Chickens, Journal of Drug Delivery and Therapeutics. 2020; 10(6):37-41
http://dx.doi.org/10.22270/jddt.v10i6.4539

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INTRODUCTION

Poultry is an important protein source of human for these dietary qualities [1]. The poultry farming occupies a prominent place in poverty reduction strategies in developing countries [2]. To optimize poultry production, farmers utilize pharmaceutical products such as antibiotic and antiparasitic to prevent outbreak of diseases . However, the search for organic products and the risk of developing resistance is directing research towards natural alternative solution such as the use of plant extracts [3]. Thus, several research studies have reported the beneficial effects of the use of plant extracts on avian coccidiosis [4], bacterial diseases [5] and zootechnical performance of chickens [6]. Thus, studies have shown that the aqueous extract of *Thonningia sanguinea* improves zootechnical performance of broilers chickens [7]. However, the effect of these herbs on parameters such as blood electrolytes which are indicators of good kidney and heart health should be evaluated [8]. Thus, the aim of the present study is to evaluate the effect of aqueous extract of *Thonningia sanguinea* on blood electrolytes of broiler chickens.

MATERIAL AND METHODS

Plant material

The plant material used for the study were *T. sanguinea* inflorescences collected at Assabou-Kouassikro, a village located in the commune of Sakassou in the center of Côte d'Ivoire. The Hubbard broilers chickens feed used in the experiment were supplied by the Ivograin Company.

Preparation of the aqueous extract of *T. sanguinea*

The inflorescences of *T. sanguinea* were cut and dried out of the sun for 10 days and then crushed. The aqueous extract was prepared according to the method [9]. 100g of *T. sanguinea* powder are added to 1L of water with magnetic stirring for 48h. The resulting mixture is filtered and then evaporated under vacuum at 30° C to obtain the aqueous extract of *T. sanguinea*.

Determination of zootechnical parameters

In order to determine the effect of the aqueous extract of *T. sanguinea* on the zootecnical parameters, 200 chicks with an average weight of 48.7 ± 3.3g were acclimatized for 2 weeks. These chicks were vaccinated against Newcastle, Gumboro and infectious bronchitis. After this acclimatization period, the chickens were divided into 2 batches of 100 chickens and numbered 1 to 100. The chickens of the control group (Batch C) have received unsupplemented water. Those of the batch E received drinking water containing 10g / L of aqueous extract of *T. sanguinea* for one week from the 22nd to the 29th day of age. The chickens of both batches received the same amounts of feed daily. Each week, the chickens were weighed individually along with the rest of the uneaten feed. The different weight obtained allowed us to determine the average weight, the weight gain and the consumption index of each batch according to the method [10].

Determination of serum electrolytes concentrations

To assess the influence of *T. sanguinea* extract on certain blood electrolytes, blood samples were taken from the wing vein of chickens using a syringe. The bloods collected in heparin tube were centrifuged. The serum electrolytes (HCO_3^-, Na^+, K^+, Cl^-) concentrations were measured using routine diagnostic techniques autoanalyser, SmartLyte (Diamond Diagnostic).

Statistical analyzes

The data obtained were analyzed with Graphpad software. 5.1. Data were expressed as mean ± SEM. The results were analyzed using a one-way ANOVA. Treatment means were compared using Turkey's multiple comparison tests. Significance was set at $P \leq 0.05$.

RESULTS

Figure 1 show the effect of the aqueous extract of *T. sanguinea* on weight growth, weight gain and consumption index. Analysis of this figure shows an increase weight growth of both batches of chickens. However, the chickens that received the aqueous extract *T. sanguinea* showed the greatest weight growth at the 29th day. At the end of the study, the mean weight of the treated chickens (batch E) was significantly ($p < 0.05$) higher than that of the chickens of the control group (batch C). This increase weight increase from the 29th day was justified by the greater weight gain ($p < 0.05$) of the treated chickens compared to the control (figure 2). The weight gain obtained on the 43rd day was 400.6 ± 84g for Batch E against 315.5 ± 52g for the control batch.

The consumption index obtained of treated chickens was lower than that of untreated chickens from 29th day until the end of the study (figure 3).

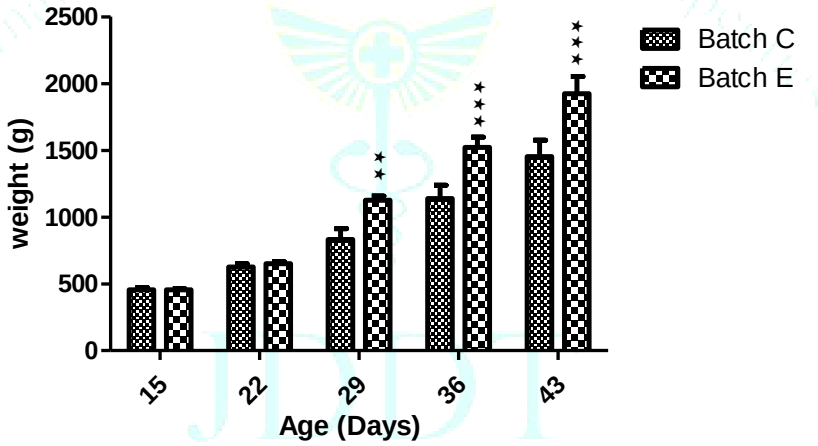

Figure 1: Body weight growth. Values are expressed as mean ± SEM (n = 100 ; ** significant difference $p < 0.01$compared to control group ; *** significant difference $p < 0.001$ compared to control group

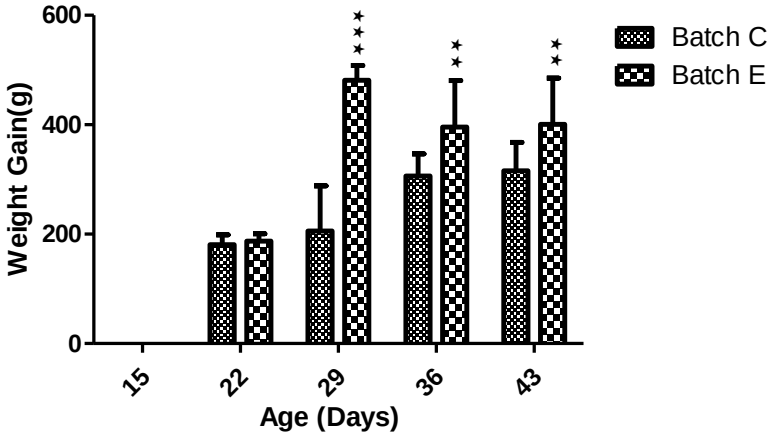

Figure 2 : Body weight gain. Values are expressed as mean ± SEM (n = 100); ** significant difference $p < 0.01$compared to control group ; *** significant difference $p < 0.001$ compared to control group

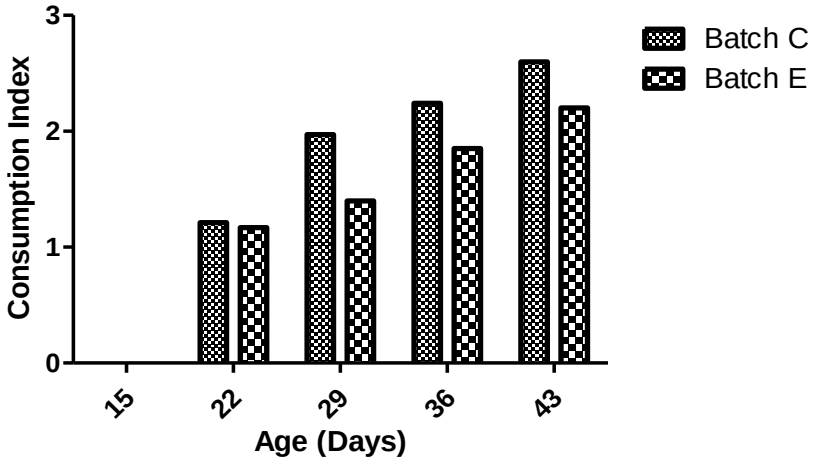

Figure3 : Consumption index

Figure 4 shows the effect of the aqueous extract of *T. sanguinea* on serum bicarbonate ion concentrations of broilers during the study. The analysis of this figure indicates that the blood bicarbonate level of the treated chickens did not vary significantly ($p < 0.05$) from the control group during the study. The data in figure 5 presents the sodium ion concentration of normal chickens and the treated broilers chickens. Those results show no difference ($p < 0.05$) between the treated chickens (batch E) and the untreated chickens (batch C) during the period of experimentation. The figure 6 and 7 show the concentration of potassium and chloride ion of the broilers chickens. The serum electrolytes (K^+ and Cl^-) of treated chickens showed no significant difference compared to the normal control group.

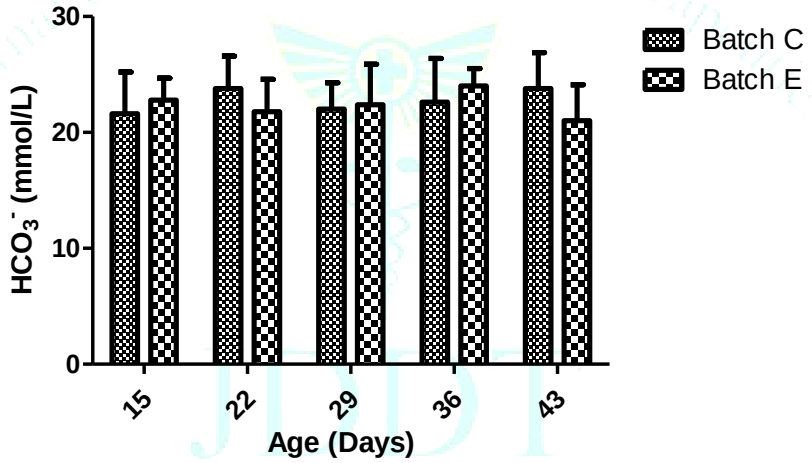

Figure 4: Effect of the aqueous extract of *T. sanguinea* on serum bicarbonate ion concentrations

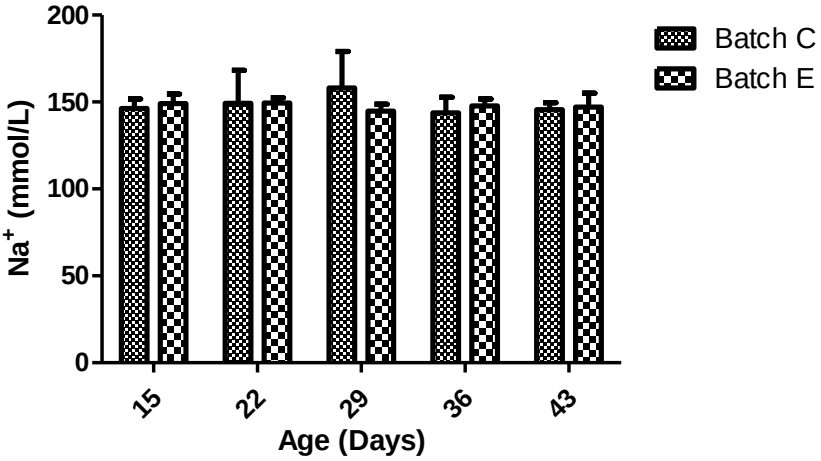

Figure 5: Effect of the aqueous extract of *T. sanguinea* on serum sodium ion concentrations

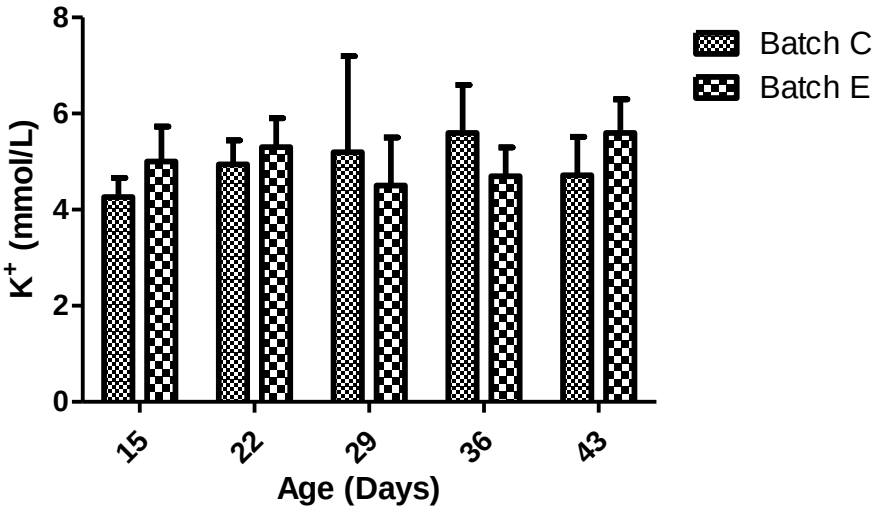

Figure 6: Effect of the aqueous extract of *T. sanguinea* on serum potassium ion concentrations

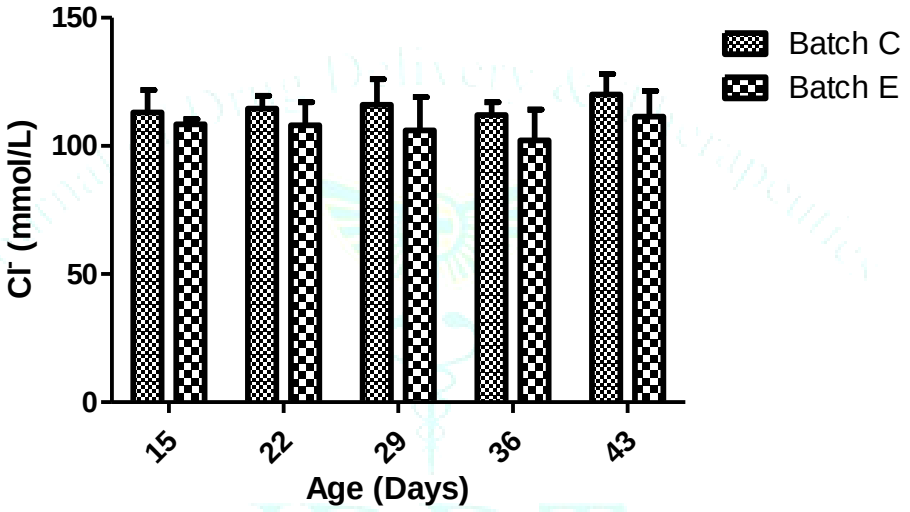

Figure 7: Effect of the aqueous extract of *T. sanguinea* on serum Chloride ion concentrations

DISCUSSION

The aim of the present study was to evaluate the effect of aqueous extract of *T. sanguinea* on blood electrolytes of broilers chickens. During this study, zootechnical parameters such as weight growth, weight gain and consumption index were also determined. The results obtained showed that the chickens treated with the aqueous extract of *T. sanguinea* had the best growth and weight gain and the lowest feed index. These results agreed with those found who demonstrated that supplementation of layer feed with aqueous extract of *T. sanguinea* improved carcass characteristics [11]. In addition, those works reported that supplementation of the feed with aqueous extract of *Moringa oleifera* leaves improves weight growth as well as weight gain of Hubbard broiler chickens [1]. These results could be explained by antibacterial [7] and antiparasitic [12] properties of *T. sanguinea*. Indeed, the uncontrolled proliferation of the intestinal flora negatively impacts nutrient digestion and absorption and decrease the weight growth. The results also showed that supplementation of the feed with aqueous extract of *T. sanguinea* did not significantly alter the level of blood electrolytes in broilers. These results were agreed with those works who reported that supplementing the water of chickens with 10g / L of aqueous extract of *T. sanguinea* did not modify the biochemical parameters such as ASAT, ALT, CPK and LDH [10].

In addition, the supplementation of wistar rats food with aqueous extract of *Aspilia africana* leaves did not negatively impact blood electrolytes concentrations [13]. Several researchers demonstrated in their studies that the roots of *Terminalia schimperiana* and the leaves of *Ficus capensis* did not significantly affect the level of blood electrolytes of rats [14, 15]. These results could be explained by the antioxidant properties of *T. sanguinea* of molecules such as polyphenols and flavonoids [16]. Indeed, phytomolecules such as flavonoids, polyphenols and gallic acid have a renal protective property [17, 18]. However, our results disagreed with those works who reported that the aqueous extract of *Momordica charantia* and *Syzygium cumini* modified potassium and sodium levels of diabetic rats [19]. In addition, the aqueous extract of *Nigella sativa* and *Ocimum gratissimum* decreases blood electrolyte levels in a renal toxicity study of wistar rats [20].

CONCLUSION

The study showed that supplementing water with 10g / L of *T. sanguinea* extract improved body weight growth as well as weight gain and reduced the drinking index. In addition, supplementation does not significantly modify the level of the blood electrolytes studied. In view of these results of the present study, the aqueous extract could be used to improve the productivity of broiler chickens.

CONFLICT OF INTEREST

The authors declare no conflict of interest

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