

The Journal of Phytopharmacology

(Pharmacognosy and phytomedicine Research)

Research Article

ISSN 2320-480X
JPHYTO 2020; 9(2): 115-199
March- April
Received: 08-03-2020
Accepted: 19-04-2020
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doi: 10.31254/phyto.2020.9207

Kouakou Severin Konan

Biotechnology and Valorisation of Agroressources Laboratory, UFR Sciences Biologiques, Peleforo GON COULIBALY University, Korhogo, 1328 Korhogo, Côte d'Ivoire

Daouda Toure

Biotechnology and Valorisation of Agroressources Laboratory, UFR Sciences Biologiques, Peleforo GON COULIBALY University, Korhogo, 1328 Korhogo, Côte d'Ivoire

Abdoulaye Toure

Biotechnology and Valorisation of Agroressources Laboratory, UFR Sciences Biologiques, Peleforo GON COULIBALY University, Korhogo, 1328 Korhogo, Côte d'Ivoire

Jean David N'guessan

Pharmacodynamic Biochemical Laboratory, University of Felix Houphouet Boigny, 22 BP 582 Abidjan 22- Côte d'Ivoire

Correspondence:

Konan Kouakou Severin

Biotechnology and Valorisation of Agroressources Laboratory, UFR Sciences Biologiques, Peleforo GON COULIBALY University, Korhogo, 1328 Korhogo, Côte d'Ivoire
Email: konanesev@gmail.com

Effect of *Thonningia sanguinea* (Balanophoraceae) on zootechnical and biochemical parameters of broiler chickens

KONAN Kouakou Severin, TOURE Daouda, TOURE Abdoulaye, N'guessan Jean David

ABSTRACT

The present study was conducted to evaluate growth performance, selected biochemical serum parameters adding in broiler chickens provide with drinking water containing an aqueous extract of *Thonningia sanguinea* (THOS). Two hundred 1-days-old broiler chickens were acclimated for two weeks. Then they were randomly divided into two equal groups of 100 chickens. In experimental group, aqueous extracts of *T. sanguinea* were added to water drinkers (10 g.L⁻¹ water) from day 15 to day 22. Through the experience, body weight, feed consumption, and number of dead birds were recorded once a week. At 15, 22, 29, 36 and 45 days of rearing, 20 birds were randomly selected in each group for serum biochemical profile analysis involving, alanine aminotransferase (ALAT), aspartate aminotransferase (ASAT), creatin phospho-kinase (CPK) and Lactate dehydrogenase (LDH). The analyses reveal that the supplementing of aqueous extract of THOS contributed to increase in body weight (p<0.05), decrease consumption index and had a positive effect on boilers survival. In addition, none of biochemical parameters were statistically different among the treatment. These findings, indicate that drinking water supplementation at 10 g.L⁻¹ of aqueous extract of THOS can be used as growth promoters in boiler water, and research to elucidate the mechanism for potentially enhanced growth in boilers is required.

Keywords: *Thonningia sanguinea*, biochemical parameters, broiler, performance.

INTRODUCTION

Poultry farming is an essential link in the animal production system. Because many assets and its socio-economic and nutritional importance, it now occupies a prominent place in most developing countries [1]. Thus, the livestock farming model adopted by Côte d'Ivoire is an intensive model based largely on semi-industrial and/or industrial farms. These farms receive technical and financial assistance of various specialized organizations. However, Ivorian poultry farming, like other countries in the sub-region, faces many constraints, including high production, costs related to equipment, feed and veterinary products [2]. Indeed, to improve productivity, farmers use products whose intensive and sometimes abusive use has led to the appearance of multi-resistant germs [3]. Recently, antibiotics or growth promoters have been banned to prevent the development of antibiotics resistance to human pathogenic bacteria and to remove antibiotic residues from poultry products. To reduce production costs and offer an alternative to pharmaceutical products, the use of plant extracts to improve poultry health and productivity can be natural alternative. Plants have been used for medicinal treatment since prehistoric time [4]. The use of natural substances may positively affect poultry zootechnical performance [5] and health [6, 7]. There is evidence to suggest that herbs, spices and various extracts have appetizing, and digestion-stimulating properties [8] and antimicrobial effects [9] which stimulate the growth of beneficial bacteria and minimize pathogenic bacterial activity in the gastrointestinal tract of poultry. *Thonningia sanguinea* (Balanophoraceae) codified THOS, is a parasitic plant [10]. The aqueous extract of THOS revealed curative properties against salmonellosis, colibacillosis [11] and avian coccidiosis [12]. It also improves zootechnical parameters such as laying rate, egg weight and shell thickness in laying hens [13]. In view of these properties, this plant would be of great interest in improving the productivity of poultry farms, particularly broiler farms. Therefore, it's appropriate to evaluate growth performance, serum biochemical parameters adding in broiler chickens provide with drinking water containing an aqueous extract of THOS.

MATERIALS AND METHODS

Study location

The experiment was carried out at the Research Farm of the Department of Biotechnology and Valorization of Agroressources, Peleforo Gon Coulibaly University (Korhogo). Korhogo is located in the North of Côte d'Ivoire. The experiment lasted for 45 days.

Plant material

T. sanguinea (inflorescences and rhizomes) were collected in June 2019 from in Sakassou region (central Côte d'Ivoire). The plant was then identified by the National Floristic Center (NFC) of the Felix Houphouët-Boigny University in Cocody-Abidjan.

Preparation of *T. sanguinea* extract

The inflorescences and rhizomes of *T. sanguinea* were properly dried in well-ventilated rooms and away from sunlight for ten days and powdered. Extraction of samples was performed by the method described by [14]. The dried plant material (100 g) was extracted using 1000 mL of distilled water for 2 days (shaking continuous with shaker). After 2 days of dissolving process, materials were filtered through cotton wool and Whatman filter paper. Then the filtrate was evaporated using rotary evaporator. At last, dried extract was obtained and then stored at 4°C in air tight screw-cap tube until analysis.

Management of experimental chickens

The experimental house and pens, watering and feeding troughs were thoroughly cleaned, disinfected and sprayed against external parasites before placing the chicks. Two hundred 1-day-old chicks with initial body weight of 50 ± 1.8 g (mean ± SD) were obtained from hatchery and were fed commercial boiler fed. Fed consumed by the chickens during the experiment was produced by professional poultry fed company. The ingredient and chemical composition of the diets are represented in table. The chicks were kept for 2 weeks to acclimatize, within this period, they were fed commercial boiler fed and given plain drinking water. On the 15th day, the 200 chicks were randomly allotted to two experimental treatment. Two experimental treatment identified as A and B were studied. Boiler chickens on A (control treatment), received drinking water without plant extract throughout rearing. Those on B from 15 to 45 days, water to drink was supplemented with aqueous THOS extracts at 10 g.L⁻¹ water. All the groups had standardized environmental (temperature, air humidity, light program and feeding condition). Birds were vaccinated against the most common viral which infect broiler chicks (Gumboro, Newcastle and infectious bronchitis).

Measurements

Body weight gain, feed consumption and number of dead

During the 45 days experiment period, body weight (BW), feed consumption (FC) and number of dead birds were recorded at weekly intervals. The average weight and the average weight gain (AWG) of each batch were determined according to the method described by [15]. The Consumption Index (CI) per lot was determined from the following formula:

$$CI = \frac{FC}{AWG}$$

Biochemical parameters

In order to determine the level of selected biochemical parameters, on d 15, 22, 29, 36 and 45 age blood was collected from the left brachial vein, of twenty (20) randomly selected birds from each group. The tests were carried out on the day of sampling. Blood samples were collected centrifuged at 3500 rpm for 10 min in order to separate the serum for determination of aspartate aminotranferase (ASAT), alanine aminotranferase (ALAT), creatine phospho kinase (CPK) and lactate

dehydrogenase (LDH). Serum chemical parameters were measured using different methods. The ALAT and ASAT were determined by the colorimetric method described by [15]. The CPK was determined according by the method described by [16]. The LDH assay was conducted by the respective methods of and [17]. The enzymatic activity (EA) corresponds to the quantity of transformed substrate or formed product per unit to time. This activity was determined by following formula:

$$EA = \frac{\Delta OD}{T} \times F_x$$

EA: Enzymatic activity (IU/L); **ΔOD:** variation of optical density; **T:** reaction time (min) ;

F_x: multiplication factor (F_{ASAT} = 1750; F_{ALAT} = 1750; F_{CPK} = 8095; F_{LDH} = 9690)

Statistical analysis

The data obtained were entered with Excel (Microsoft 2010, USA). Statistical analyses were conducted using the statistical Graphpad.5.01 (USA). The data were presented as mean ± standard deviation in tables. The test probability at *P* < 0.05 was considered statically significant.

RESULTS

Body weight, consumption index and mortality rate

The results of the effect of the THOS aqueous extract on weight growth are shown in Fig. 1. These results show that the chickens that received the solution containing 10 g.L⁻¹ of THOS aqueous extract (Batch B) had higher live weights than the chickens from the normal batch (Batch A). At the end of the study, we note a live weight of 1500±18g for lot B against 1146±15g for lot A. Statistical analysis indicates that the live weights of the chickens in lot B are significantly (*p* < 0.05) higher than those in lot A. The significant increase in the weight of Lot B fillies is accompanied by a decrease in the feed conversion rate (Fig. 2). On the other hand, we observe an increase in the feed conversion rate in the chickens of lot A during the study. On the 45th day of age, we have a consumption index of 3.35 for lot A against 2.80 for lot B. During the experiment, we recorded a mortality rate of 2% for lot B compared to 5% for lot A (Fig.3)

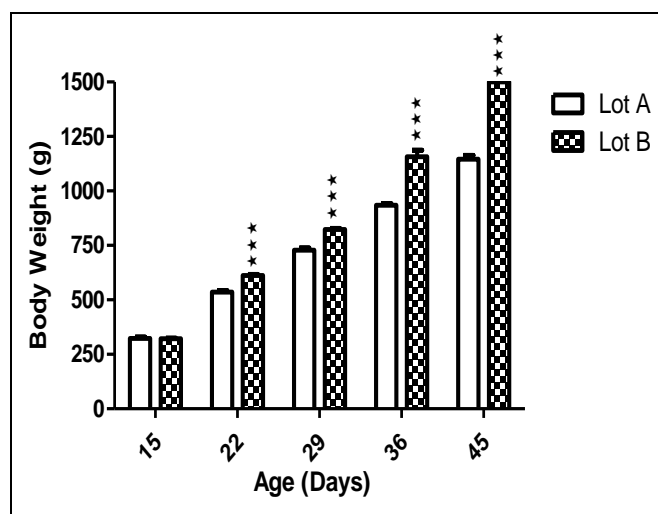


Figure 1: Average body weight. Values are expressed as mean ± SEM (n = 100); *p* < 0.05, * ** compared to control group

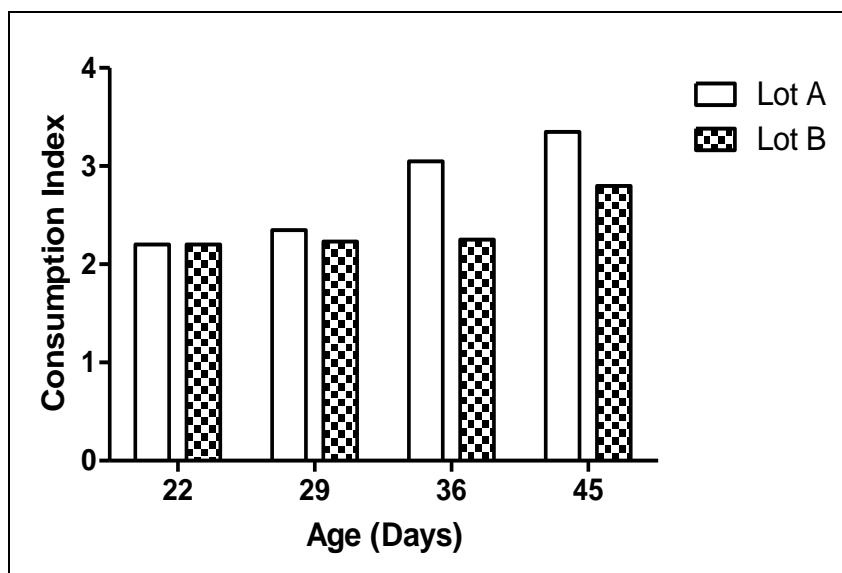


Figure 2: Consumption index

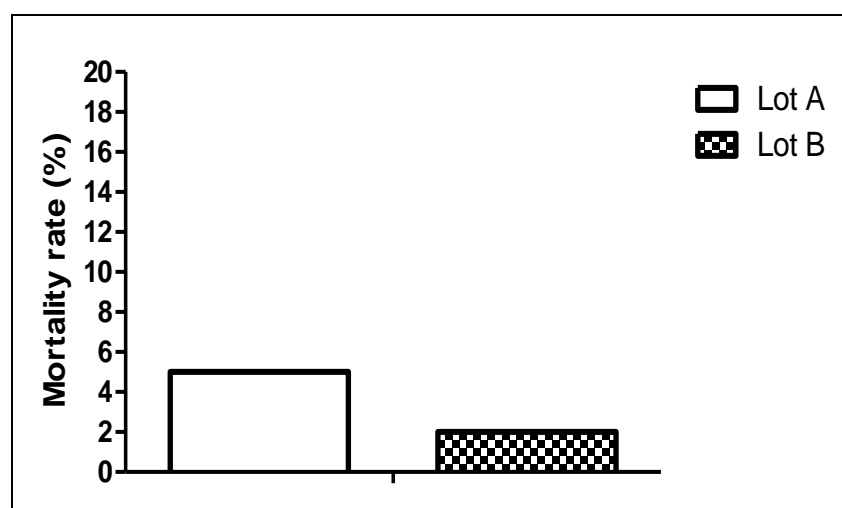


Figure 3: Mortality rate

Biochemical parameters

The results of the effect of the THOS aqueous extract on biochemical parameters are recorded in tables. The concentrations of ASAT obtained during the study are presented in Table 1. Analysis of this table reveals that from day 15 to day 29 of age, the ASAT values of the two lots are not significantly different. But from day 36 onwards, we see high levels of ASAT in the chickens of both batches. However, no significant difference was observed between the levels of ASAT in chickens from lots A and B.

The results of the effect of THOS on ALAT are reported in Table 1. The analysis shows low values during the experimentation period.

Statistical analysis indicates that there is no significant difference ($p < 0.05$) between the ALAT levels of the 2 lots.

The mean creatine kinase (CK) activity in THOS-treated (10g/L) chickens during the study ranged from 337 ± 23 IU/L to 354.5 ± 14 IU/L while the mean CK activity in untreated subjects ranged from 341 ± 10 IU/L to 364.2 ± 13 IU/L. The mean concentrations of LDH activity vary from 312 ± 18 IU/L to 345 ± 14 IU/L for Batch A and B respectively. However, there is no significant difference ($p < 0.05$) between these rates. From the 22nd day of age, the observation of table 4 shows a decrease of the average LDH levels in the chickens of the 2 lots. Analysis indicates that the CK and LDH levels of the chickens in Lot B are not statistically different ($p < 0.05$) from those in Lot A during the study.

Table 1: serum biochemical parameters of boilers

Parameters	Day of Reading	Groupe		SEM	p value
		A Control	B THOS		
ALAT (IU/L)	15	$4,75 \pm 0,9^a$	$5,75 \pm 0,5^a$	0,478 ; 0,288	0,8816
	22	$4,75 \pm 1^a$	$5,25 \pm 1,7^a$	0,478 ; 0,816	
	29	$4,5 \pm 1,3^a$	$4,75 \pm 0,5^a$	0,645 ; 0,250	
	36	$4,75 \pm 1,7^a$	$5,5 \pm 0,5^a$	0,853 ; 0,288	
	45	$4,5 \pm 1,3^a$	$4,5 \pm 0,5^a$	0,645 ; 0,288	
ASAT (IU/L)	15	$162 \pm 6,7^a$	164 ± 17^a	3,391 ; 8,954	<0,0001
	22	160 ± 12^a	$163,7 \pm 12^a$	6,455 ; 6,169	

	29	179,2±11 ^a	175±19 ^a	5,452 ; 9,428	
	36	214±7 ^b	220±10 ^b	3,764 ; 5,401	
	45	228,7±8 ^b	219,5±13 ^b	4,270 ; 4,941	
	15	345±17 ^a	337±23 ^a	8,651 ; 11,59	
	22	341±10 ^a	340±18 ^a	5,115 ; 8,957	
CPK (IU/L)	29	364,25±13 ^a	350±14 ^a	5,452 ; 7,360	0,3644
	36	352±6 ^a	348±12 ^a	3,227 ; 6,331	
	45	351,25±12 ^a	354,5±14 ^a	6,102 ; 7,489	
	15	312±18 ^a	345±14 ^a	9,313 ; 7,284	
	22	284±7 ^b	264±17 ^b	3,674 ; 8,529	
LDH (IU/L)	29	210,7±12 ^c	222±16 ^c	5,893 ; 8,114	<0,0001
	36	224±15 ^c	226±4 ^c	7,927 ; 2,415	
	45	227,7±10 ^c	235,25±11 ^c	5,391 ; 7,958	

Values in the same row not sharing a common superscript differ significantly (p<0.05)

DISCUSSION

In this study the effect of waters supplementation with *Thonningia sanguinea* extract on growth performance and biochemical parameters of broiler chickens was evaluate. The results obtained showed that the chickens that received drinking water containing 10 g.L⁻¹ aqueous extract of THOS had the best weight growth with an average live weight compared to the control group of the study. These results of the present study are in agreement with the observations [5] indicated that broilers diet supplementation with aqueous extract of *T. sanguinea* (10 g.L⁻¹) had positive effect on the performance of boilers chicks in term of weight gain. Other authors, reported that supplementation of chicken feed with THOS aqueous extract increased weight growth [18], carcass characteristics and physicochemical parameters of the laying hen muscles [19]. Present findings also, THOS had a positive effect on boilers survival. These results are in agreement with those found by [5] who recorded 2% mortality in chickens treated with THOS compared to 6 % in untreated subjects.

These results could be explained by the pharmacological properties of this plant. Indeed, various studies have shown that *T. sanguinea* has antimicrobial [20], antioxidant [21] and anti-inflammatory effects [22].

The effect of the aqueous extract of THOS on biochemical parameters (ALAT, ASAT, CPK and LDH) was assessed by determining the concentrations of these enzymes during the study. The result on serum biochemical parameters indicates that supplementation of THOS in the water of boilers chickens did not show any variation of biochemical parameters. Similar results have been found by [13] who showed that THOS supplementation does not lead to changes in carcass characteristics and physico-chemical muscle parameters. The results of present study, also, in agreement with [23], who reported no changes in AST and ALT levels in mice treated with a palm wine extract from the rhizomes of *Turmeric longa*. The results obtained could result from the hepatoprotective and antioxidant properties of THOS. Indeed, the aqueous extract of THOS has a hepatoprotective activity against aflatoxin B1 [24].

CONCLUSION

The study consisted in evaluating the effect of the aqueous extract of *T. sanguinea* on some zootechnical and biochemical parameters of broilers. The results obtained show that the incorporation of THOS extract in drinking water improves weight performance and leads to a decrease in the consumption index as well as the mortality rate. In addition, the incorporation of the aqueous extract does not significantly alter the biochemical parameters studied (ALAT, ASAT, CPK and LDH). Therefore, the aqueous extract of *T. sanguinea* could be recommended to farmers to improve poultry productivity.

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HOW TO CITE THIS ARTICLE

Konan KS, Toure D, Toure A, N'guessan JD. Effect of *Thonningia sanguinea* (Balanophoraceae) on zootechnical and biochemical parameters of broiler chickens. J Phytopharmacol 2020; 9(2):115-119.