



Haematological and Serum Biochemical Indices of Broiler Chicks Fed Different Levels of Doum Palm (*Hyphaene Thebaica*) Pulp Extract

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ABSTRACT

This experiment was undertaken to examine the haematological and serum biochemical indices of broiler chicks fed different levels of doum palm (*Hyphaene thebaica*) pulp extract using 250 - 1-day old broiler chicks (Ross 308). On arrival birds were randomly distributed into five treatment groups with five replicates containing ten birds each. The experiment lasted for 28 days and a completely randomized design model was adopted. Basal diet was formulated according to the requirement for broilers. Birds in treatment A (TA) was fed basal diet without doum palm pulp extract which also served as control while those in TB, TC, TD and TE were given basal diet with doum palm pulp extract at 2 mL, 4 mL, 6 mL and 8 mL/litre of water. Birds also had unrestricted access to fresh water and feed. Hematocrit, total erythrocytes, hemoglobin and total leucocyte count varied from 25.40 - 30.44 %, 3.52 - 4.15 ($\times 10^{12}/L$), 72.12 - 86.30 g/L and 7.22 - 10.28 ($\times 10^9/L$). Value obtained were lowest in TA compared to the other treatments ($p < 0.05$). Total protein, globulin, albumin and cholesterol count were significantly ($p < 0.05$) influenced except for uric acid and creatinine counts ($p > 0.05$). However, all values obtained were within the established ranges for healthy birds. It was concluded that feeding doum palm pulp extract to broiler chicks up to 8 mL/litre had no detrimental effect on the health status of birds

INTRODUCTION

Hyphaene thebaica (doum palm) is a dioecious and desert palm that belongs to the family *Arecaceae*. The plant can grow up to 17 meters high, it is a native to the Arabian Peninsula and also to the northern half and western part of Africa (Bidlack et al., 2000) where it is widely distributed and tends to grow in places where groundwater is present (Wendakoon et al., 2011). The leaves are fan shaped and measure about 120 by 180 cm while the bark is fairly smooth, dark grey and bears the scars of fallen leaves. The leaf stalks are about a metre long, sheathing the branch at the base and armed with stout upward-curving claws (Abdulsalam et al., 2018). The leaves, roots and stems of doum palm contains numerous phyto-constituents including, tannins, alkaloids, saponins, flavonoids, terpenoids amongst others (Shehu et al., 2015; Kamis et al., 2003). These compounds possess therapeutic properties including, anti-inflammatory, antioxidant, antifungal, antiviral, anti-helminthic, cytotoxic, immune-stimulatory, hepato-protective, antimicrobial, hypolipidemic, anti-cancer, anti-diabetic, anti-diarrhea and gastro-protective (Abdulsalam et al., 2018; Eldahshan et al., 2008).

LITERATURE REVIEW

Traditionally, the extracts from the leaves of doum palm pulp extract can be used in the treatment of headache, toothache and general body pain. Stem bark extracts can be used for the treatment of hypertension, rheumatism, skin infections, dental caries, fevers and eye infections. The roots extracts are used for the treatment of gonorrhoea, toothache, stomachache, dysentery and bronchitis (Nwosu et al., 2008; Reda, 2015). Aqueous extracts from doum palm pulp have been reported to be effective in the treatment of bacterial infections such as, *Salmonella* spp, *Staphylococcus* spp, *Escherichia coli*, *Pseudomonas aeruginosa*, amongst others (Hsu et al., 2006; Faten, 2009).

Previous studies have shown that plant extracts can influence blood parameters of birds (Muritala et al., 2022). However, there are disparity in most of these results due to specie, geographical location, age of plants and processing methods (Ojediran et al., 2024; Alagbe et al., 2022). Evaluating blood parameters will help in disease diagnosis and to determine the extent of malnutrition in animals (Isaac et al., 2013). There is a dearth of information on the effect of doum palm pulp extract on the blood profile of broiler chicks. This experiment will help to establish an optimum level for birds and will further promote food safety.

METHODOLOGY

Experimental Site

The experiment was undertaken at the Poultry Section of Vet Etcetera Concepts Integrated Farms Chikuku, Tsoho, Kwali Local Government, Kuje Abuja located between latitude 8°51'40"N and longitude 7°14' 25"E.

Plant Collection, Identification and Preparation of Doum Palm Pulp Extract

Dried doum palm was sourced from Gwagwalada local market in Abuja and sent to International Institute of Tropical Agriculture, Kubwa for proper identification. Thereafter, the pulp was separated with from the kernel using a

sharp knife, air dried for six days and grounded into fine particles using a mortar and pestle. 300 grams of doum palm pulp powder was immersed into 1.5 liters of water boiled at 30 °C for 10 minutes, stirred continuously and kept in the refrigerator at 4°C for 72 hours before it was filtered using a Whatman filter paper to obtain doum palm pulp extract.

Management of Experimental Animals, Diet and Design

A total of 250 -1 day old broiler chicks (Ross 308) was procured from a reputable hatchery in Oyo state, Nigeria and randomly distributed into five treatment groups with five replicates containing ten birds each. Birds were kept in a well prepared battery cage, properly disinfected two weeks prior to the commencement of the experiment. On arrival, chicks were weighed to obtain their average initial body weight and placed on anti-stress for 7 days. The experiment lasted for 28 days and a completely randomized design model was adopted. Based diet which was consistent with the National Research Council's requirement in NRC (1994). Treatment A (TA): basal diet without doum palm pulp extract, TB, TC, TD and TE received same diet with doum palm pulp extract at 2 mL, 4 mL, 6 mL and 8 mL in that order. Birds had unrestricted access to water and feed.

Blood Collection and Evaluation

At the end of the study, five birds were randomly selected per treatment for haematological and serum biochemical indices. 4 mL of blood was collected from each birds, 2mL each for haematology and serum. Blood samples for haematology was collected into bottles with anticoagulant while those for serum were collected into bottles free from anticoagulant and placed in an ice pack to maintain the quality of the samples. Haematological parameters were analyzed using Systmex automated blood analyzer (Model SF/009G, China) while those for serum analysis was done using Labrom auto analyzer (model GKL/Y002, China).

Phytochemical Analysis and Proximate Analysis of Experimental Diet

Assessment of experiment diet was done using standard laboratory procedures outlined by AOAC (2000). Quantification of phytochemicals was carried out according to the methods recently published by Alagbe (2024).

Statistical Analysis

Data collected on heamatological and serum biochemical indices were subjected to one -way analysis of variance using SPSS (version 18). Significant differences among the groups were subjected to comparisons using the Duncan multiple range test of the same software. All differences were considered to be statistically significant when $p < 0.05$.

RESULTS AND DISCUSSION

Ingredient and chemical composition of basal diet is presented in Table 1. Sample crude protein (23.02 %), crude fibre (3.25 %), ether extract (3.98 %), calcium (1.09 %), phosphorus (0.60 %), lysine (1.38 %), methionine (0.60 %) and metabolizable energy (3000.4 kcal/kg). Result obtained is in agreement with the nutritional requirements for broilers according to NRC (1994).

Phytochemical composition of doum palm pulp extract is presented in Table 2. Flavonoid is the major compound with 402.3 mg/mL followed by phenols (391.2 mg/mL), alkaloids (205.6 mg/mL) terpenoids (108.7 mg/L), saponins (90.85 mg/L) and tannins (85.11 mg/mL) respectively. Result obtained aligns with the reports of Alagbe and Anuore (2023); Aboshora et al. (2014). The presence of flavonoids in doum palm pulp extract shows that is capable of exhibiting antimicrobial, antioxidant, immune stimulator (Olajuyige et al., 2011), anti-allergic (Singh et al., 2022), anti-inflammatory, antifungal (Gawali and Jadhav, 2012) and gastro-protective properties (John, 2024a; John, 2024b). Phenolic compounds inhibits the activities of free radicals (Musa et al., 2020; Sharma, 2012) and possess anti-inflammatory (Odozi et al., 2014), anticancer (Doughari, 2012), anti-diarrhea and hypolipidemic properties (Adewale et al., 2021; John, 2024c). Terpenoids possess antimicrobial, anti-diarrhea (Arawande et al., 2013), antiviral and anti-diabetic properties (Lima et al., 2010). Saponins and tannins have been reported to have antibacterial, gastro-protective and cytotoxic properties (Aworinde et al., 2016). Alkaloids are strong analgesics and also has hepato-protective properties (Prabhu and Guruvayoorappan, 2012).

Haematological parameters of broiler chicks fed different levels of doum palm pulp extract is presented in Table 3. Haematocrit, total erythrocytes, hemoglobin and total leucocytes values were higher in treatment E [(30.44 %, 4.15($\times 10^{12}/L$), 86.30 g/L, 10.28 ($\times 10^9/L$)], treatment D [(30.41 %, 4.13 ($\times 10^{12}/L$), 86.26 g/L, 10.23 ($\times 10^9/L$)], treatment C (30.23 %, 4.11 ($\times 10^{12}/L$), 86.13 g/L, 10.11 ($\times 10^9/L$)), treatment B (30.18 %, 4.08 ($\times 10^{12}/L$), 85.09 g/L, 10.08 ($\times 10^9/L$))] than in treatment A (25.40 %, 3.52 ($\times 10^{12}/L$), 72.12 g/L, 7.22 ($\times 10^9/L$)] ($p < 0.05$). Haematocrit value was within the normal range (25.00 - 36.00 %) cited by Etim et al. (2014); Bounous and Stedman (2000). The result suggests the absence of anaemia or low concentration of iron in the blood (John, 2024c). Total erythrocyte and haemoglobin values reported in this study was within the normal range 2.08 - 8.12 ($\times 10^{12}/L$) and 25.00 - 65.00 g/L reported by Islam et al. (2004); RAR (2009). This indicates oxygen sufficiency in the tissue of birds thus allowing the availability of nutrients in the body (John, 2024d). Total leucocytes count was within the normal range 6.00 - 21.00 ($\times 10^9/L$) reported by Obikaonu et al. (2012) when birds were fed diet supplemented with neem leaf powder. This outcome is an indication that the integrity of the immune system was not affected (John, 2024e; Café et al., 2012).

Total protein, albumin and globulin values follow similar trend, values were higher ($p < 0.05$) in treatment E [(57.63 g/L, 26.21 and 31.42 g/L)], treatment D [(57.20 g/L, 26.11 and 31.09 g/L), treatment C (56.14 g/L, 26.02 and 30.12 g/L), treatment B [(54.50 g/L, 25.01 and 29.49 g/L) and lowest in treatment A (45.41 g/L, 20.41 and 25.00 g/L) respectively. Uric acid and creatinine values which ranged from (3.02 - 3.68 mg/dL) and 0.40 to 0.45 mg/dL were not influenced ($p > 0.05$) by the treatment. Cholesterol value was higher in treatment A (100.7 mg/dL) than in treatment B (94.23 mg/dL), treatment C (90.80 mg/dL), treatment D (90.27 mg/dL) and treatment E (90.11 mg/dL) ($p < 0.05$). Total protein value obtained in this study was within the

range (20.09 - 50.09 g/L) reported by Udofia et al. (2007) when starter broilers were fed diet supplemented with an herbal supplement. Creatinine and uric acid values were within the normal ranges 1.82 to 4.00 mg/dL and 0.10 - 1.00 mg/dL cited by Thall (2007). This result suggests the absence of renal failure (John, 2024e). The values of cholesterol in this study were within the normal range (80.00–210 mg/dL) reported by American Metabolic Testing Laboratories (2001). This indicates that doum palm pulp extract possess hypolipidemic properties, thus reducing the risk of heart disease (Omokore and Alagbe, 2019).

CONCLUSIONS AND RECOMMENDATIONS

It was concluded that doum palm pulp extract has therapeutic or pharmacological properties due to the presence of phytochemicals in them. Feeding broilers up to 8 mL per liter of doum palm extract improved blood parameters and all values recorded were within the established ranges. This result suggests that the extract has a hepato-protective and immune-stimulatory properties.

Table 1: Ingredient and Chemical Composition of Basal Diet

Ingredient/Feedstuffs	Content (%)
Maize	52.0
Rice bran	3.40
Soybean meal	33.0
Fish meal	4.00
Calcium carbonate	2.50
Bone meal	5.00
Lysine	0.20
Methionine	0.25
Mineral/Vitamin Premix	0.25
Sodium chloride	0.30
Total	100.0
Nutrient levels (%)	
Crude protein	23.02
Crude fibre	3.25
Crude fat	3.98
Calcium	1.09
Phosphorus	0.60
Lysine	1.38
Methionine	0.60
Energy (Kcal/kg)	3000.4

Table 2: Phytochemical Composition of Doum Palm Pulp Extract

Variables	Concentrations (mg/mL)
Terpenoids	108.7
Tannins	85.11
Alkaloids	205.6
Flavonoids	402.3
Phenols	391.2
Saponins	90.85

Table 3: Haematological Parameters of Broiler Chicks Fed Different Levels of Doum Palm Pulp Extract

Variables	A	B	C	D	E	SEM
Hematocrit (%)	25.40 ^b	30.18 ^a	30.23 ^a	30.41 ^a	30.44 ^a	5.33
Total erythrocytes ($\times 10^{12}/L$)	3.52 ^b	4.08 ^a	4.11 ^a	4.13 ^a	4.15 ^a	0.81
Haemoglobin (g/L)	72.12 ^b	85.09 ^a	86.13 ^a	86.26 ^a	86.30 ^a	11.4
Total leucocytes ($\times 10^9/L$)	7.22 ^b	10.08 ^a	10.11 ^a	10.23 ^a	10.28 ^a	1.96

Means on the same row having different superscripts are significantly different ($p < 0.05$)

Table 4: Serum Biochemical Parameters of Broiler Chicks Fed Different Levels of Doum Palm Pulp Extract

Variables	A	B	C	D	E	SEM
Total protein (g/L)	45.41 ^b	54.50 ^a	56.14 ^a	57.20 ^a	57.63 ^a	6.07
Albumin (g/L)	20.41 ^b	25.01 ^a	26.02 ^a	26.11 ^a	26.21 ^a	4.01
Globulin (g/L)	25.00 ^b	29.49 ^a	30.12 ^a	31.09 ^a	31.42 ^a	5.02
Uric acid (mg/dL)	3.02	3.40	3.51	3.62	3.68	0.06
Creatinine (mg/dL)	0.42	0.40	0.41	0.42	0.45	0.01
Cholesterol (mg/dL)	100.7 ^a	94.23 ^b	90.80 ^b	90.27 ^b	90.11 ^b	9.17

Means on the same row having different superscripts are significantly different ($p < 0.05$); SEM: standard error of mean

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