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Effect of Feeding Different Levels of Doum Palm (Hyphaene Thebaica) Pulp Extract on the Growth Performance of Broiler Chicks

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A B S T R A C T

A 28 days trial was carried out to examine the effect of feeding different levels of doum palm pulp extract on the growth performance of broiler chicks. The experiment was undertaken at Vet Etcetera Concepts Integrated Farms Chikuku, Tsoho, Kwali Local Government, Abuja, Nigeria using 250 - 1 day old broiler chicks (Ross 308) was randomly distributed into five treatment groups with five replicates and each replicate consist of ten birds each. Experimental diet (basal) was compounded according to the requirement for broilers by Nutritional Research Council (1994). A completely randomized design model was adopted and the experimental duration was 28 days. Chicks in treatment 1 (T1) was fed basal diet without doum palm pulp extract which served as the control, T2, T3, T4 and T5 were received same diet with doum palm pulp extract at 2 mL, 4 mL, 6mL and 8mL per liter of water in that order. Average daily weight gain was lower in T1 (25.62 g) than in T2 (36.06 g), T3 (36.66 g), T4 (37.14 g) and T5 (37.12 g) ($p<0.05$). Similarly, average daily feed intake was higher in T5 (70.70 g), T4 (70.69 g), T3 (70.65 g), T2 (70.40 g) than in T1 (57.65 g) ($p<0.05$). Feed conversion ratio, protein intake and energy intake values which ranged from 2.00 - 2.24, 371.26 - 455.35 (g/bird) and 4854.06 - 5953.45 (kcal/ME/bird) were significantly improved among birds in T2, T3, T4 and T5 compared to T1. It was concluded that birds can tolerate up to 8 mL doum palm extract without causing any negative effect on their growth performance

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INTRODUCTION

The use of plant extract or phytogenics is globally gaining interest due to the dangers pose by overuse of antibiotics in poultry production which has led to several problems such as emergence of antimicrobial resistance and deposit of toxic residues in animal products (Omokore and Alagbe, 2019). Plant extract are non-toxic, effective, environmental friendly and has no withdrawal period (Alagbe, 2024). Among the potential plants with therapeutic properties is doum palm. It is also considered as one of the useful plants of the world (Reda, 2015).

LITERATURE REVIEW

Doum palm (Hyphaene thebaica) is a desert palm native to Egypt, sub-Saharan Africa and West India. It can grow to a height of about 6 or 9 m tall and usually characterized by forked stems with fan shaped leaves of about 70 cm long (Abdulsalam et al., 2018; Eldahshan et al., 2008). The fruit is rich in nutrients, crude protein (2.86 %), lipid (0.9 %), ash (6.2 %), crude fibre (12.8 %), carbohydrate (68.4 %) and minerals, calcium, phosphorus, zinc, potassium, magnesium, manganese, cobalt, iron, sodium and nickel (Wendakoon et al., 2011). Doum palm has numerous medicinal properties due to the presence of tannins, alkaloids, flavonoids, terpenoids and saponins with antimicrobial, anti-inflammatory, antioxidant, hepto-protective, immune-stimulatory amongst others (Shehu et al., 2015; Kamis et al., 2003). Aqueous extract from the pulp, root and stem have been used traditionally in the treatment of fever, hypertension, stomach disorders, tooth ache and skin infections (Hussein et al., 2010). They have also been reported to scavenge the activities of free radicals and inhibit the activities of pathogenic bacteria (Reda, 2015).

Previous studies have shown that supplementation of plant extracts in the diet of broilers have positive influence on the growth performance of birds (Adewale et al., 2021), reduce the activities of free radicals, reduce the retention time of feeds by stimulating the activities of digestive enzymes (Musa et al., 2020). However, there is scanty information on the dietary supplementation of doum palm pulp extract. This research is timely as it will help to provide natural alternative to antibiotics and also help to address the increasing rate in multidrug resistance among birds.

METHODOLOGY

Description of Experimental Location, Collection and Preparation of Doum Palm Pulp Extract

The experiment was carried out at 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. Dried doum palm was procured from a local market in Gwagwalada, botanical identification was carried out by a certified taxonomist at Sumitra Research Institute, Abuja. The pulp was separated mechanically from the seed, air dried for another five days and then ground into fine particles using a hammer mill. 200 grams of doum palm pulp powder was soaked into 1500 mL of water boiled at 30 °C for 10 minutes, stirred

and kept in the refrigerator at 4°C 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) with initial body weight of 45.10 ± 0.02 g were purchased from a reputable hatchery in Ibadan. Bird unbox upon arrival after their average initial weight was recorded using a digital sensitive scale and randomly distributed into five treatment groups with five replicates containing ten birds each. Birds were kept in a well prepared battery cage equipped with feeders, nipple drinkers as well as electrical bulbs to supply heat and illumination to birds. Chicks were placed on Mdstress plus water soluble powder® (a mixture of multivitamins and glucose at 10 g to 5 liters of water) for 7 days. A completely randomized experimental design was adopted for the 28 days trial and the feed used for this experiment was corn-soy bean meal based diet which was consistent with the National Research Council's requirement for birds (NRC, 1994). Birds were provided free access to water and feed.

Experimental Set -Up

- Treatment 1: basal diet without doum palm pulp extract
- Treatment 2: basal diet with 2 mL doum palm pulp extract per litre of water
- Treatment 3: basal diet with 4 mL doum palm pulp extract per litre of water
- Treatment 4: basal diet with 6 mL doum palm pulp extract per litre of water
- Treatment 2: basal diet with 8 mL doum palm pulp extract per litre of water

Growth Performance Parameters

- Average body weight gain (expressed in grams) = Average final body weight subtracted from average initial body weight.
- Daily weight gain (in grams) = Average final body weight subtracted from average initial body weight divided by 28 days
- Total feed consumption = Left over minus feed served (expressed in grams)
- Daily feed consumption (g) = Left over subtracted from feed served divided by 28

Analysis of Phyto-Constituents in Doum Palm Pulp Extract and Proximate Analysis of Experimental Diet

Quantification of phyto-constituents in doum palm pulp extract were analyzed as previously described by Alagbe (2024). Proximate analysis of experimental diet was carried out using Lacron automated near infra-red feed analyzer (Model: DG/009V, Netherlands).

Statistical Analysis

Data obtained on growth performance was subjected to one -way-analysis of variance (ANOVA) using SPSS (v22). Significant differences among the treatments were subjected to comparisons using the Duncan multiple range test of the same software. All differences were considered to be statistically significant when $p < 0.05$

RESULT AND DISCUSSION

Phyto-compounds in doum palm pulp extract is presented in Table 2. Result revealed the presence of flavonoids (402.3 mg/g), phenols (391.2 mg/g), alkaloids (205.6 mg/g) followed by terpenoids (108.7 mg/g), saponins (90.85 mg/g) and tannins (85.11 mg/g) in that order. The presence of these compounds proved that doum palm extract had numerous medicinal properties such as, anti-inflammatory, antioxidant (John, 2024a, John, 2024c), antimicrobial (Ojediran et al., 2024a), antifungal, antiviral (Ojediran et al., 2024b; Omokore and Alagbe, 2019), hepato-protective, immune-stimulatory (Singh et al., 2022; Muritala et al., 2022), cytotoxic, anti-cancer, antidiarrhoea, anti-diabetic (John, 2024b, John, 2024c), cardio-protective (Shittu et al., 2024; Alagbe et al., 2024), hypolipidemic amongst others. The concentrations of bioactive compounds recorded in this study was higher than 0.265 mg (tannin), 0.340 mg (flavonoids), 0.054 mg (saponins) and 0.116 mg (phenols) reported by Hussaini et al. (2024). Discrepancies in results could be attributed to processing methods, geographical location, specie and age of plant used for the study (John, 2024e; Alagbe and Daniel, 2023). However, outcome in this experiment aligns with the reports of Hsu et al. (2006); Faten (2009). The presence of high flavonoids and phenolic compound concentrations indicates that doum palm pulp extract could function as a strong antioxidant thereby scavenging the activities of free radicals as well as preventing the activities of pathogenic organisms (gram -ve and gram +ve bacteria) (Alagbe, 2022; Alagbe et al., 2022). The presence of alkaloids and tannins is a sign that the extract can act as an analgesics, gastro-protective and antimicrobial activities (Mohammed et al., 2010; Lamiaa and Laith, 2018).

The growth performance of broiler chicks fed different levels of doum palm pulp extract is shown in Table 3. Body weight gain were higher ($p<0.05$) in treatment 5 (T5) (1042.11 g), T4 (1040.11 g), T3 (1026.55 g), T2 (1019.59 g) and lower in T1 (717.44 g). Similarly, feed intake was maximum among birds in T2 (2mL per liter of water), T3 (4mL per liter of water), T4 (6mL per liter of water) and T5 (8mL per liter of water) compared to T1 (control) ($p<0.05$). The improvement in birds fed doum palm pulp extract suggests that it is capable of facilitating the secretion of digestive enzymes to promote the efficient feed absorption in their system (Alagbe et al., 2024; John, 2024d). This result gives a clue that the phyto-components in doum palm pulp extract possess high pharmacological properties, thus providing a balanced intestinal flora (Agubosi et al., 2022; Musa et al., 2020). The similarities in body weight gain among birds in T2, T3, T4 and T5 is a sign that they can tolerate up to 8 mL per liter of water without affecting their health status. Results on feed intake showed that doum palm pulp extract could positively influence the palatability of feed and improve feed conversion ratio of birds (Alagbe and Daniel, 2024; Adewale et al., 2021). Result obtained in this study is in agreement with the reports of Agubosi et al. (2022) when Moringa oleifera essential oil was supplemented in the diet of broiler chicks. Protein and energy intake values which ranged from 371.26 - 455.35 (g/bird) and 4854.06 - 5953.45 (kcal/ME/bird) in this experiment was within the range 355.16 - 500.9 (g/b) and 4500.2 - 6000.3 (kcal/ME/bird)

reported by Musa et al. (2020) when phytogenics was fed to broilers. This result may be attributed to the antimicrobial, antioxidant and gastro-protective properties of doum palm pulp extract.

CONCLUSIONS AND RECOMENDATION

It was concluded that doum palm pulp extract is rich in several phyto-components with medicinal properties. The result showed that contained significant concentration of phenolic compound and flavonoids that have been reported to possess antioxidant and antimicrobial properties. It was concluded that broiler chicks can tolerate up to 8 mL per liter of water without compromising their health status.

Table 1: Ingredient and Chemical Composition of Basal Diet

Ingredient/Feedstuffs	Content (%)
Maize	50.4
Rice bran	3.50
Soybean meal	33.0
Fish meal	4.00
Calcium carbonate	3.00
Bone meal	6.00
Lysine	0.20
Methionine	0.20
Mineral/Vitamin Premix	0.25
Sodium chloride	0.35
Total	100.0
Nutrient levels (%)	
Crude protein	23.02
Crude fibre	3.11
Crude fat	3.95
Calcium	1.06
Phosphorus	0.58
Lysine	1.32
Methionine	0.59
Energy (Kcal/kg)	3006.1

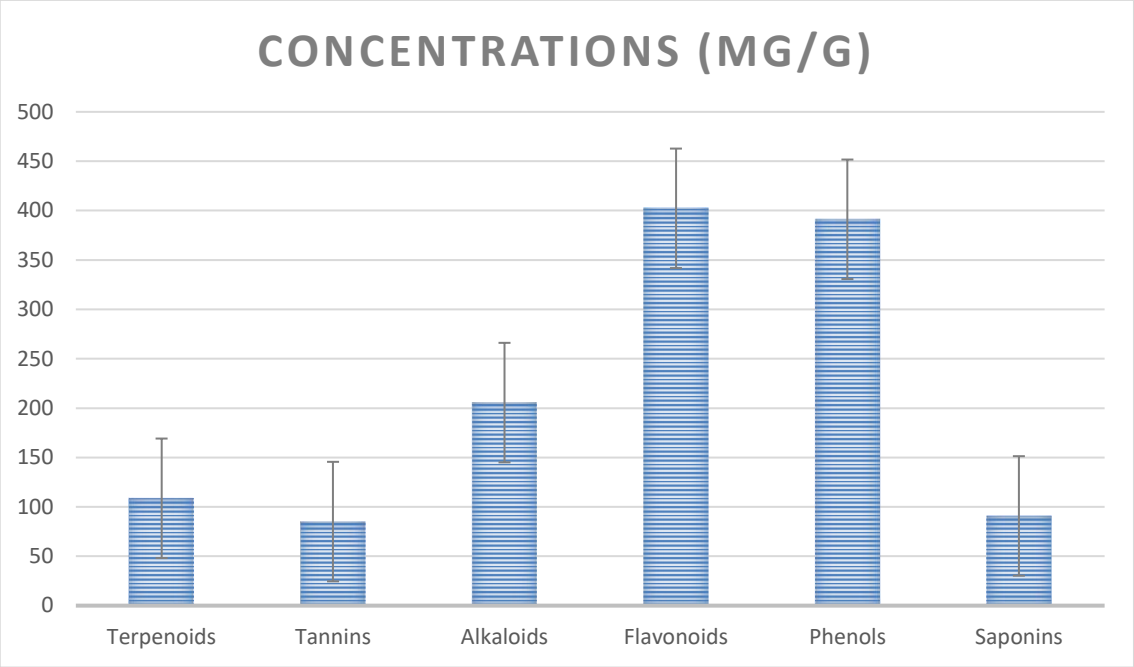

Figure 1. Phyto-Compounds in Doum Palm Pulp Extract

Table 2. Effect of Feeding Different Levels of Doum Palm Pulp Extract on the Growth Performance of Broiler Chicks

Variables	T1	T2	T3	T4	T5	SEM
Experimental period (days)	28	28	28	28	28	-
Initial body weight (g/bird)	45.66	45.61	45.55	45.49	45.09	0.03
Final body weight (g/bird)	763.1^{b}	1055.2^{a}	1072.1^{a}	1085.6^{a}	1087.2^{a}	23.89
Body weight gain (g/bird)	717.44^{b}	1009.59^{a}	1026.55^{a}	1040.11^{a}	1042.11^{a}	21.17
Average daily body weight gain (g/bird)	25.62^{b}	36.06^{a}	36.66^{a}	37.14^{a}	37.21^{a}	0.02
Feed intake (g/bird)	1614.2^{b}	1971.2^{a}	1978.3^{a}	1979.4^{a}	1979.8^{a}	35.86
Average daily feed intake (g/bird)	57.65^{b}	70.40^{a}	70.65^{a}	70.69^{a}	70.70^{a}	0.05
Feed conversion ratio	2.24^{a}	2.00^{b}	2.00^{b}	2.00^{b}	2.00^{b}	0.01
Protein intake (g/bird)	371.266	453.376	455.009	455.262	455.354	9.74
Energy intake (kcal/ME/bird)	4854.06	5927.59	5948.94	5952.25	5953.45	67.05

T1: basal diet without doum palm pulp extract; T2, T3, T4 and T5: basal diet with doum palm pulp extract at 2 mL, 4 mL, 6 mL and 8 mL in that order; SEM: standard error of mean

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