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Effect of *Carica Papaya* Leaf and Seed Meal Composite Mix as Feed Supplement on Haemato-Biochemical Parameters of Broiler Chicks

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Abstract

This study examined the effect of dietary supplementation of *Carica papaya* leaf and seed meal composite mix (CLSMM) on hemato-biochemical parameters in broiler chicken. *Carica papaya* leaves were chopped, air-dried and milled to form *Carica papaya* leaf meal (CLM). Seeds collected from ripe *Carica papaya* fruits were also air-dried and ground to *Carica papaya* seed meal (CSM). The CLM and CSM were thoroughly mixed together in ratio 3:1 to form a CLSMM. Two basal diets were formulated for the starter and grower/finisher phases. Each basal diet was divided into 6 equal portions and labelled Diets 1 to 6. Thereafter, 396 one-day old Arbor Acres broiler chicks were distributed to 6 treatments (66 birds/treatment; 11 birds/replicate) in a completely randomized design. On day 42 of the experiment, blood was collected from the birds for haematological and serum biochemical indices determination. The white blood cells values ($5.83 \times 10^9/l$ and $6.25 \times 10^9/l$) recorded in birds fed diets 5 and 6, though similar to those values ($5.07 \times 10^9/l$ and $4.77 \times 10^9/l$) recorded in birds fed diets 3 and 4; was significantly ($p < 0.05$) higher than those values ($3.22 \times 10^9/l$ and $3.70 \times 10^9/l$) recorded in chickens fed diets 1 and 2. The aspartate amino transferase and cholesterol level decreased significantly ($p < 0.05$) with dietary CLSMM supplementation in the broiler chickens.

Keywords: Broiler chicken, pawpaw leaf/seed, feed

Introduction

The current global restriction on the use of antibiotic growth promoter in animal production has stimulated interest of animal producers on the use of other alternatives such as phytochemical feed additives, phytobiotics, phytogetic feed additives among others as growth promoters (Ganguly, 2013). Phytogetic feed additives are plant derived product (e.g. extract, dried plant material, essential oil, pure isolated compound) containing plant metabolites as active principles (Akbarian *et al.*, 2016). Most of these active secondary plant metabolites belong to classes of flavonoides, isoprene derivatives and glucosinolates; a large number of which has been suggested to act as antioxidants and antibiotics (Suganya *et al.*, 2016). At present, phytochemicals and phytogetic feed additives have been proposed as antibiotic growth promoter replacement and source of anabolic compounds that enhances growth (Hashemi and Davoodi, 2010).

Plants herbs such as garlic, lemon grass, menthol, alchornea and black peper were reported to improve the performance of various species of livestock animal (Oloruntola *et al.*, 2016a; Suganya *et al.*, 2016). Pawpaw (*Carica papaya*) is among the tropical plants that has gained attention. *Carica papaya* is native to the tropic of America and widely spread throughout Africa. Pawpaw plant was reported as the most natural source of papain, an effective natural proteolytic enzyme and purgative (Onyimonyi and Ernest, 2009). Papain was also reported to contain phytochemicals such as alkaloid, saponin, tannin, glycoside and flavonin; some of which are of pharmacological importance (Ikeyi *et al.*, 2013).

Some of these phytochemical have been proved to possess anti-microbial properties, increase immune system and promote the release of natural chemicals that attack tumor cells (Ikeyi *et al.*, 2013). *Carica papaya* seeds contain some alkaloids, and some fatty acids such as palmitic, oleic, stearic and linoleic acid. Singh and Ali (2011) reported the use of pawpaw seed in treatment of diarrhoea, bleeding piles, enlarged liver and spleen. The use of pawpaw leaf meal in ethno-medicine application and performance improvement in broiler chicken was also reported (Onyimonyi and Ernest, 2009). However, it has been observed and reported that the use of phytochemicals as feed ingredients or supplements could cause major deviations from normal physiological state and reflect in haemato-biochemical indices of the animals (Oloruntola *et al.*, 2016b).

Therefore this study was carried out to assess the effect of pawpaw leaf and seed meal composite mix supplementation on haemato-biochemical parameter in broiler chicks.

Materials and Methods

The experimental site was the Poultry unit of Agricultural Technology Teaching and Research Farm, The Federal Polytechnic, Ado Ekiti, Nigeria. The site has geographical coordinates: latitudes of 7°37'N and 7°12'N and longitudes 5°11'E and 5°31'E. The mean annual rainfall and mean annual temperature is 1247mm and 26.2°C respectively (Oloruntola *et al.*, 2016a). Fresh *Carica papaya* leaves were plucked within the Federal Polytechnic, Ado-Ekiti, Nigeria. The leaves were chopped, spread on a clean tarpaulin to air-dry for about 14 days and milled to *Carica papaya* leaf meal (CLM). Seeds collected from ripe pawpaw fruits were also spread lightly on tarpaulin to air-dry for 20 days and ground to form *Carica papaya* seed meal (CSM). The CLM and CSM were mixed together in ratio 3:1 to form a *Carica papaya* leaf and seed meal composite mix (CLSMM) and thereafter analysed for saponin (Brunner, 1994), steroid (Madhu *et al.*, 2016), tannin (Aina *et al.*, 2012), terpenoid (Sofowora, 1993), cardiac glycoside (Sofowora, 1993). Thereafter, 2 basal diets were formulated for the starter (0 to 21 d) and grower/finisher phase (22 to 42 d) to meet the minimum requirement of broiler chicken (NRC, 1994). The basal diets were divided into 6 equal portions and labelled Diets 1 to 6. Diet 1 contained 0g/kg CLSMM supplementation, diet 2 was supplemented with 2 g/kg CLSMM, while diet 3, diet 4, diet 5 and diet 6 were supplemented with 4, 6, 8 and 10 g/kg respectively. The six diets were analysed for proximate composition (AOAC, 1995).

Three hundred and ninety six 1-day old Arbor Acres broiler chicks were distributed to 6 treatments (66 birds/treatment; 11 birds/replicate) in a completely randomized design. Eleven (11) birds were housed in their respective pen (200 x 110 cm). The birds were fed *ad libitum* throughout 42 days of the experimentation. At the end of the feeding trial (day 42), blood samples were collected from the birds as described by Oloruntola *et al.*, (2016a). The haematological indices were determined as described by Lamb (1981); while the serum biochemicals were determined as previously described by Baker and Silverton (1986). Completely randomized design was used in this experiment.

All data collected were subjected to analysis of variance using SPSS version 20. The treatment means were separated by Duncan multiple range test.

Results and Discussion

The phytochemical constituent of *Carica papaya* leaf and seed meal composite mix (CLSMM) is shown in Table 1. Steroid (58.40 g/kg), saponin (47.20 g/kg), terpenoid (128.20 g/kg), tannin (61.70 g/kg) and cardiac glycoside (185.90 g/kg) were detected in the composite mix. These phytochemicals constituents in plants or plant parts had been reported to be responsible for various therapeutic effects (anti-microbial, anti-oxidant and anti-pyretic) being observed (Adesokan *et al.*, 2008). Table 2 shows the effect of CLSMM supplementation on haemato-biochemical parameters in broiler chickens. Of all the haematological indices studied, only the white blood cells (WBC) was significantly ($p < 0.05$) affected. The WBC and its differentials are involved in defending the body against infectious disease (Oloruntola *et al.*, 2016b).

Table 1: Phytochemical constituents of *Carica papaya* leaf and seed meal composite mix (CLSMM)

Phytochemicals	Quantity (g/kg)
Steroid	58.40
Saponin	47.20
Terpenoid	128.20
Tannin	61.70
Cardiac glycoside	185.90

The WBC values ($5.83 \times 10^9/l$ and $6.25 \times 10^9/l$) recorded in chickens fed diets 5 and 6, though similar to those values ($5.07 \times 10^9/l$ and $4.77 \times 10^9/l$) recorded in birds fed diets 3 and 4; was significantly ($p < 0.05$) higher than those values ($3.22 \times 10^9/l$ and $3.70 \times 10^9/l$) recorded in chickens fed diets 1 and 2. This implies that the WBC value increases with increase in the CLSMM supplementation levels in the broiler chicken. This result supports earlier reports that phytochemicals enhance nutrigenomic effect on development of immunity (Oloruntola *et al.*, 2016b; Valenzuela-Grijalva *et al.*, 2017). The stability of other haematological indices (red blood cells, haemoglobin concentration and packed cell volume) in the various dietary treatments in this study may indicate that the various dietary treatments did not affect the normal haematopoiesis in the broiler chickens.

The total protein, creatinine and alkaline phosphate concentration in the experimental birds were stable ($P > 0.05$) across the dietary treatments; while the aspartate amino transferase (AST) concentration decreased significantly ($P < 0.05$) with increased dietary CLSMM supplementation across the dietary treatment.

Table 2: Effects of *Carica papaya* leaf and seed meal composite mix (CLSMM) supplementation on haemato-biochemical parameters in broiler chickens

Parameters	D1	D2	D3	D4	D5	D6	SEM	P value
Haematological indices								
White blood cells (x10 ⁹ /l)	3.22 ^b	3.70 ^b	5.07 ^{ab}	4.77 ^{ab}	5.83 ^a	6.25 ^a	0.33	0.03
Red blood cells (x10 ¹² /l)	2.50	2.50	2.25	2.45	2.40	2.25	0.04	0.12
Haemoglobin conc. (g/dl)	9.15	9.80	9.23	9.50	9.90	9.10	0.11	0.20
Packed cell volume (%)	41.33	43.00	44.00	47.67	48.66	46.00	1.50	0.77
Serum biochemical indices								
Total protein (g/dl)	5.55	6.12	6.15	5.98	6.02	6.08	0.43	1.00
Creatinine (µmol/l)	39.05	32.80	20.30	26.55	23.40	42.15	2.86	0.15
Alkaline phosphate (iu/l)	33.64	31.82	32.28	35.29	34.80	33.10	1.84	0.99
Aspartate aminotransferase (iu/l)	7.48 ^a	5.08 ^{ab}	6.06 ^{ab}	4.76 ^{ab}	4.59 ^b	4.21 ^b	0.39	0.05
Cholesterol (µmol/l)	3.00 ^a	1.70 ^{ab}	1.20 ^b	1.03 ^b	0.71 ^b	1.02 ^b	0.24	0.04

^{a,ab}Means within a row with different letters are significant ($p < 0.05$), SEM: Standard error of mean.

D1: 0 g/kg CLSMM (control); D2: 2 g/kg CLSMM; D3: 4 g/kg CLSMM; D4: 6 g/kg CLSMM; D5: 8 g/kg; D6: 10 g/kg CLSMM.

This may imply that the dietary treatment did not just support normal hepatic and renal function in the experimental birds (Lording and Friend, 1991), but also exerts hepato-protective effect in the experimental birds, since abnormal increase in AST concentration indicates liver and biliary system disease (Lording and Friend, 1991). In addition, the cholesterol level decreased ($p < 0.05$) significantly with dietary CLSMM supplementation; such that broiler chickens fed the diets 5 and 6 had the lowest cholesterol level. This reduction of cholesterol level with CLSMM supplementation in this study affirms the effect of the phytochemicals present in the CLSMM. For example, saponins had been reported to reduce the uptake of cholesterol in the gut through intra-luminal physiochemical interaction (Yilkal, 2015). Similar result was recorded by Oloruntola *et al* (2016a) in broiler chickens.

Conclusion and Recommendation

Based on the data obtained from this study, it was concluded that dietary CLSMM supplementation did not pose health threat to the broiler chicken, hence; 10g/kg dietary CLSMM supplementation could be used to maintain the health status of the broiler chicken.

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