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EFFECT OF VARYING LEVELS OF HEAT TREATED PAWPAP (*Carica papaya*) LEAF EXTRACT ON GROWTH PERFORMANCE AND BLOOD PROFILE OF FINISHER BROILERS

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ABSTRACT

One hundred and twenty-four weeks old broiler chickens (Ross 308 strain) were used to evaluate the growth performance and blood parameters of broiler birds administered pawpaw-leaf extract. The birds were divided into four treatment groups in a completely randomized design (CRD), consisting of T₁, T₂, T₃ and T₄. Each treatment group was further divided into three replicates of ten birds each. One diet was formulated for the whole treatment groups. One hundred grams (100g) of pawpaw leaves were mashed in a mortar with pestle, the mashed leaves were mixed with 500ml of water after which it was filtered with a sieve to obtain a homogenous aqueous leaf extract. The leaf extract was heated at 70°C after which it was allowed to cool. Four experimental extracts; T₁, T₂, T₃, and T₄, were prepared and pawpaw leaf extract was included at the rates of 0ml, 40ml, 60ml and 80ml/l of water for T₁, T₂, T₃, and T₄ respectively. The study lasted for 28-days during which body weight gain, feed intake, water intake, feed conversion ratio, haematology and serum biochemistry were studied. Results showed that daily body weight gain and feed intake increased significantly ($p > 0.05$) for the treatments administered pawpaw leaf extract. Water intake decreased ($p > 0.05$) progressively with increasing levels of pawpaw leaf extract. White blood cells were significantly ($p > 0.05$) lower for T₄. Total protein, albumin and uric acid were significantly ($p > 0.05$) affected by the pawpaw leaf extract. It was concluded that the heat-treated pawpaw leaf extract for finisher broilers enhanced body weight gain, feed intake, haematological and serum parameters of finisher broiler birds. It is therefore recommended that the inclusion of heat-treated pawpaw leaf extract up to 80ml can be included in water of finisher broiler without any adverse effect on their performance and blood profile.

Key words: *Carica papaya*, leaf extract, body weight gain, haematology, serum biochemistry, broiler chickens

INTRODUCTION

Broiler chickens are fast-growing birds that are kept primarily for meat purposes and they produce tender meat with soft pliable and flexible breast bone cartilage, they attain slaughter weight at approximately eight weeks of age. Broiler chickens are distinctive because of their body weight, improved carcass composition, short production period, and a substantial rise in carcass dressing percentage which result from an increase in the content of edible portion in the total body weight of the birds (Shahin *et al.*, 2000). The weight gain and blood constituent of broiler chickens are dependent on the quality and quantity of feed consumed. The high cost of broiler feed in Nigeria precipitated by the ever-increasing cost of feed ingredients has resulted in declining productivity and profitability of intensive broiler production. This has caused the price of broiler products (meat and egg) to rise far beyond the purchasing ability of an average Nigerian (Onyimonyi *et al.*, 2017).

The use of growth promoters has been adopted for several decades in animal production to enhance animal growth performance, increase prime cut yield,

and decrease intramuscular fat deposit (Valenruela *et al.*, 2017). However, due to the human and animal health risks associated with the use of synthetic feed and water additive as growth promoters in meat production and given the importance of broiler production in bridging the animal protein gap in Nigeria, it becomes imperative to exploit feed ingredients of lower cost and sound biological value that can partly supplement the conventional protein and energy sources in broiler diet. The use of locally available and cheap feed ingredients has received particular attention as a viable alternative to the use of conventional feedstuff (Adejumo *et al.*, 2012). Phytochemicals such as herbs, spices and plant extracts are safe and available substitutes for conventional feed ingredients.

Pawpaw is popular in the tropics and sub-tropics because of its ease of cultivation, rapid growth, quick economic return and easy adaptation to diverse soil and climate condition. Pawpaw whose leaf has been previously identified by Oloruntola *et al.* (2018) as a natural source of papain, chymopapain A and B and papaya peptidase A. Papain is a proteolytic enzyme and thus capable of enhancing protein digestion (Oloruntola

et al., 2018). Pawpaw aids in the digestion of protein at acid, alkaline or neutral medium due to the presence of papain, a natural enzyme, which also helps in cleansing of gastro intestinal track (Jiwuba, 2018). In addition, the pawpaw leaf contains broad spectrum of phytochemicals, which includes alkaloids and phenols. Phenolic compounds have high antioxidant activity and free radicals scavenging capacity with the mechanism of inhibiting enzymes responsible for reactive oxygen production (Kahkonen *et al.*, 2001). Therefore, the objective of this study was to assess the effects of pawpaw leaf extract on the growth performance and blood indices of finisher broilers.

MATERIALS AND METHODS

The experiment was conducted at the poultry unit of Federal College of Agriculture Ishiagu, Ivo Local Government Area of Ebonyi state, Nigeria. The college is located about three kilometers away from Ishiagu main town. The College is situated at latitude 5°6'N and longitude 70°3'E with an average rainfall of 1000-1600mm and a prevailing air temperature condition of 27°-28°C and relative humidity of about 88%.

The pawpaw leaves that were used for the experiment were harvested green and fresh within the College premises. The fresh green pawpaw leaves were sorted to remove damaged leaves and washed to remove dirt and impurity and then drained properly. Then one hundred grams of pawpaw leaves were mashed in a mortar with a pestle, the mashed leaves were mixed with 500ml of water, after which it was filtered with a sieve to obtain a homogenous aqueous leaf extract. The leaf extract was heated at 70°C, after which it was allowed to cool at room temperature. Four experimental extracts; T₁, T₂, T₃, and T₄, were prepared and pawpaw leaf extract was included at the rates of 0ml, 40ml, 60ml and 80ml/l of water for T₁, T₂, T₃, and T₄ respectively.

One hundred and twenty-four weeks old broiler chicks were purchased from a reputable commercial farm in Enugu, Enugu state. The groups were randomly assigned to the four experimental treatments (T₁, T₂, T₃, and T₄) in a completely randomized design. They were randomly allotted to four treatments in a completely randomized design (CRD). Each treatment was replicated three times with ten birds per replicate and fed the same self-formulated feed (Table 1).

Table 1: Percentage composition of the self-formulated diet

Ingredients	Compositions (%)
Maize	59.00
Soya bean meal	16.00
Groundnut cake	13
Wheat offal	7.00
Fish meal	2.50
Oyster shell	0.50
Bone meal	1.00
Salt	0.25
Premix	0.25
Methionine	0.25
Lysine	0.25
Total	100
Calculated values	
Crude protein	21.30
Metabolizable Energy (kcal/kg)	3003.70
Crude fiber	3.49
Calcium	1.30
Phosphorus	0.54

The birds were housed in a well-ventilated cement-floored pens with wood shavings as litter material and equipped with feeders and drinkers. Each treatment received a designated treatment extract for 28 days. The pawpaw leaf extract was administered to the birds at an interval of two days. The extracts were prepared and served fresh. Water and feed were provided *ad libitum* throughout the experimental period. Proper sanitation and routine managements were adequately maintained throughout the experimental period. Feed intake was determined daily for each replicate by subtracting feed refusals of the following day from each day's feed supply. Initial live weights of the birds

were taken at the beginning of the experiment using weighing balance and weekly thereafter in the morning before feeding. Final live weight was obtained by weighing the birds at the end of the experiment. Other growth performance indices were calculated accordingly.

At the end of the experiment, 3 birds were randomly selected from each treatment, one per replicate. Blood samples were collected early in the morning using sterilized syringes and needles. 4ml of blood samples were obtained from the birds through the wing vein. The samples were separated into two lots and used for haematological and biochemical determinations. An

initial 2ml was collected from each sample using labelled sterile universal bottle containing 1.0 mg/ml ethyldiamine tetracetic acid (EDTA) and used for haematological analysis. Another 2ml was collected into an anti-coagulant-free bottle and used for the serum biochemical studies. For haematological parameters, the following were determined; packed cell volume (PCV) was determined using the micro haematocrit centrifuge. Haemoglobin concentration (Hb) was estimated using cyanmethaemoglobin method, White blood cell (WBC), Red Blood Cell (RBC), Mean Corpuscular Haemoglobin (MCH) and Mean Corpuscular Haemoglobin concentration (MCHC) were calculated as described by Lamb, (1981). For the serum biochemical indices, the parameters determined were; total protein, albumins, globulins, glucose, creatinine, and uric acid.

Data were subjected to one-way analysis of variance (ANOVA) as described by Steel and Torrie (1980). The differences in treatment means were separated using Duncan Multiple Range technique (DMRT) as outlined by Obi (2002).

RESULTS AND DISCUSSION

The growth performance of finisher broilers served heat-treated pawpaw leaf extract is presented in Table 2. There was significant ($P < 0.05$) difference for the final body weight, total body weight gain, daily body weight gain, total feed intake, daily feed intake, and total water intake and daily water intake. The final body weight of the birds was significantly ($P < 0.05$) affected, the lowest ($P < 0.05$) value of 2506.67g was obtained from T₁ (0ml) while the highest ($P < 0.05$) value of 2679.26g was obtained for T₄ (80ml). T₁ produced significantly ($p < 0.05$) low body weight gain and daily body weight gain. The higher body weight gain and daily body weight gain for the birds served the leaf extract could be attributed to papain (a proteolytic enzyme) present in pawpaw leaves, which could have aided digestion of protein, thereby releasing the free amino acids necessary for growth (Onyimonyi *et al.*, 2009). In addition, the phytobiotic properties of pawpaw leaf extract could also play roles in enhancing the performance of the birds (Fallah *et al.*, 2013). Papain in pawpaw leaf extract was reported to have the ability to lyse microorganisms (Adu *et al.*,

2009) and some phytochemicals in plants are known for their antimicrobial ability. Therefore, the superior performance recorded by birds given pawpaw leaf extract might have been caused by the maintenance of a healthy gut through the inhibition of pathogens and reduction of microbial toxic metabolites by the phytochemicals in pawpaw leaf extract. The phytobiotics present in pawpaw leaf extract could as well increase the digestive enzyme (trypsin, lipase, amylase and chymotrypsin) secretion (Fallah *et al.*, 2013) and probably facilitate improved nutrient utilization and enhanced performance (Khan *et al.*, 2012). The improved performance recorded concur with the finding of Oluoruntola (2019), who found a significant improvement in body weight gain and feed efficiency in broiler chicken supplement with pawpaw leaf and seed blend. Total feed intake and daily feed intake were observed to be significantly ($P < 0.05$) higher for the treatments served pawpaw leaf extract. The highest feed intake recorded for the treatments served pawpaw leaf extract may have been an attempt by the birds to meet their nutritional requirements, hence it could be adduced that pawpaw leaf extract can stimulate feed intake. The daily feed intake observed in this study was similar to the findings of Onyimonyi *et al* (2009) but did not agree with that of Herbert (2000) who observed that feed intake depresses with an increasing dietary level of various leaf extract. Forbes (2006) observed that the composition and availability of nutrient, the concentration of protein, the balance of amino-acids and deficiency or excess of minerals or vitamins can all affect feed intake. It is therefore possible that components in pawpaw leaf extract such as proteolytic enzymes (papain, chymopapain A and B and papaya peptidase) may have created an enabling gut environment suitable for the release and absorption of digestible nutrients such as protein and energy required for optimum growth and development. The water intake of the birds were significantly ($P < 0.05$) affected. Water intake decreases across the treatment as the inclusion level of pawpaw leaf extract increased. The progressive decrease of water intake as the inclusion level of leaf extract increases can be attributed to the taste and colour of the water which makes the water less palatable to the birds.

Table 2: Growth performance of finisher broilers served heat-treated pawpaw leaf extract

Parameter	T1	T2	T3	T4	SEM
Initial body weight (g)	1653.33	1567.33	1669.33	1669.33	
Final Body weight (g)	2506.67 ^c	2641.67 ^{ab}	2583.33 ^b	2679.26 ^a	21.41
Body Weight Gain (g)	853.34 ^d	1074.34 ^a	914.00 ^c	1009.93 ^b	29.64
Daily Weight gain (g)	30.48 ^d	38.37 ^a	32.64 ^c	36.07 ^b	1.41
Total Feed intake (g)	3181.67 ^d	3603.24 ^b	3537.78 ^c	3712.55 ^a	65.29
Daily Feed intake (g)	113.63 ^d	128.79 ^b	126.35 ^{bc}	132.59 ^a	3.30
Total water Intake (ml)	11172.00 ^a	10808.00 ^b	10556.00 ^c	10295.60 ^d	73.86
Daily Water intake (ml)	399.00 ^a	386.00 ^b	377.00 ^c	367.70 ^d	3.20
Feed Conversion Ratio	3.73	3.36	3.87	3.68	0.10

^{a-d} means on the same row with different superscripts are significantly ($P < 0.05$) different

Table 3 showed the haematological status of finisher broilers chicken administered varying levels of pawpaw leaf extract. The result showed no significant ($P>0.05$) difference for packed cell volume, haemoglobin, red blood cell, mean corpuscular haemoglobin concentration, and mean corpuscular volume, which agrees with the finding of Obikaonu *et al.*, (2004) for broiler chickens administered pawpaw leaf extract. White blood cell showed a significant ($P<0.05$) difference. White blood cells are involved in protecting the body from infection, kill virus-infected cells, enhance the production of antibodies and engulf foreign material that enters the body (Olugbemi *et al.*,

2010). The significantly lower value of white blood cells observed in birds on T4 implied that birds on the T4 were better protected against infection due to the protective nature of the leaf extract than those on the other treatment groups. The result agrees with the finding of Iheukwumere (2003), who reported a significant difference in white blood cells. However, these observations may not have predict health implication because the values recorded for all the parameters in the birds in all the treatments fall within the normal range as reported by Benerjee (1988) for healthy birds.

Table 3: Heamatological indices of finisher broiler served heat-treated pawpaw leaf extract

Parameters	T1 (0ml)	T2 (40ml)	T3 (60ml)	T4 (80ml)	SEM
Packed cell volume (%)	33.30	28.30	29.3	30.53	0.86
Haemoglobin (g/dl)	3.41	2.81	2.71	3.30	0.15
Red blood cell ($\times 10^{12}/l$)	3.58	3.23	3.28	3.50	0.07
White blood cell ($\times 10^9/l$)	20.33 ^a	20.64 ^a	20.37 ^a	17.14 ^b	0.15
Mean cell volume (fl)	93.70	90.61	91.07	93.29	1.08
Mean cell haemoglobin concentration (%)	40.74	43.74	45.30	41.62	0.76

^{a-b}means on the same row with different superscript are significantly ($p<0.05$) different

Table 4 shows the serum biochemistry of finisher broiler administered varying levels of heated treated pawpaw leaf extract. Serum biochemistry is a labile biochemical system which can reflect the condition of the organism and the changes happening to it under influence of internal and external factors. The result showed that there was no significant difference in the serum biochemistry except in total protein, albumin and uric acid. The result indicates that the leaf extract

poses no threat to the health of the birds as the values recorded in all the parameters fell within the normal range reported by Benerjee (1988) for healthy birds. The total protein and albumin are indirect indices for measuring nutritional protein adequacy. The higher total protein and albumin value in T₄ suggest that the nutritional quality of pawpaw leaf extract up to 80ml/liter as a supplement may be accepted.

Table 4: Serum biochemical indices of finisher broiler served heat-treated pawpaw leaf extract

Parameters	T1 (0ml)	T2 (40ml)	T3 (60ml)	T4 (80ml)	SEM
Total protein (g/dl)	3.07 ^b	2.70 ^d	2.90 ^c	3.23 ^a	0.09
Albumin (g/dl)	1.74 ^b	1.5 ^c	1.77 ^b	1.91 ^a	0.06
Globulin (g/dl)	1.33	1.19	1.13	1.32	0.04
Creatinine (mg/dl)	0.79	0.83	0.76	0.77	0.06
Uric acid (mg/dl)	11.94 ^c	12.61 ^a	12.08 ^b	9.36 ^d	0.41
Glucose (mg/dl)	138	135.33	142	134.6	71.69

^{a-c} means on the same row with different superscripts are significantly ($p<0.05$) different

CONCLUSION

The incorporation of pawpaw leaf extract at measured quantities into the drinking water of broiler finisher had nutritional benefits without any deleterious effects on the response criteria measured. Pawpaw leaf extract therefore, promoted weight gain, feed intake and had no deleterious effects on the blood parameter and therefore can be administered up to 80ml/liter in the drinking water of finisher broiler.

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