ISSN 1682-8356
ansinet.org/ijps

INTERNATIONAL JOURNAL OF

POULTRY SCIENCE

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International Journal of Poultry Science 8 (9): 905-909, 2009
ISSN 1682-8356

Effect of Graded Levels of Dried Pawpaw (*Carica papaya*) Seed on the Performance, Haematology, Serum Biochemistry and Carcass Evaluation of Chicken Broilers

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Abstract: A feeding trial was conducted to investigate the effect of graded levels of Dried Pawpaw Seed (DPS) on growth performance, haematological parameters and carcass evaluation of chicken broilers. One hundred day-old broilers were randomly divided into four treatments groups of diets containing 0, 5, 10 and 15% DPS in a Completely Randomized Designed (CRD) for a period of six weeks. The results of this experiments showed that there were significant differences ($p>0.05$) in feed intake and weight gain across the dietary treatment with diet containing 5% DPS having the highest weight gain of 17.58g/bird/day, while birds fed diets with 15% DPS had the lowest weight gain (11.18 g/bird/day), nutrient utilization was higher in birds fed 5% DPS. There were significant differences ($p<0.05$) in the haematological parameters, serum biochemistry and carcass parameters across the dietary treatment. The results of this study indicate that DPS can be included in broiler diet at 5% level.

Key words: Dried pawpaw seed, broilers, nutrient utilization

INTRODUCTION

Formulation of poultry diets greatly depends on plant protein that can supply the necessary amino acids that are not available in adequate quantities in the cereals (Atteh, 2000). Plant protein is relatively cheaper and readily available than the animal protein source. Iyayi (2008) stated that the heavy dependence on plant protein feed resources is mainly economic rather than physiologic. Protein supplement from Soya bean and groundnut (Peanut) products are the most prominent of the conventional protein supplement used in poultry feeding in Nigeria, they constitute between 20-45% of finished feed and concentrates, however their prices have continued to increase geometrically. This trend of prices increases have forced poultry farmers to look for alternatives. The trend had also precipitated the popularity of unconventional protein source. Several unconventional plant protein have been investigated in recent years for their potential in poultry feeding (Iyayi, 2008). The use of unconventional feed ingredients with high nutritive value can reduce the pressure on conventional feed ingredients and speed up the attainment of feed security for the monogastric animal (Onifade and Odunsi, 1999).

Attention has been given to some tropical fruits that are of economic importance (Glombitza *et al*., 1993) among which pawpaw (*Carica papaya*) is one. Pawpaw is native to the tropics of America but widely spread throughout Africa. Pawpaw fruits has a juicy taste rich in anti oxidant nutrients like carotene, vitamin C, vitamin B, flavonoids, folate, panthotenic acids and minerals such as potassium and magnesium, the fruit is also a good source of fibre all these are reported to promote the functions of cardiovascular system and provide protection against colon cancer (Fischer, 1998; Franco *et al*., 1993). Pawpaw seed contain active ingredients such as caricacin; an enzyme carpesemine which is a plant growth inhibitor and oleanolic glycoside which had been found to cause sterility in male albino rats (Das, 1980). Pawpaw seed also contain some alkaloids in their endosperm. Chinoy *et al*. (1997) reported that oleic, palmitic, stearic and linoleic acid are fatty acids present in the seed. Pawpaw seed is readily available in the tropics because the fruits can be found all year round, after consumption of the fruits the seed are thrown away and regarded as waste products, while the search for cheap sources of feedstuffs continues the potentials of pawpaw seed need to be evaluated and fully exploited as ingredients in animal feed. This study determined the proximate composition of pawpaw seed and investigates its suitability as an alternative feed ingredient for poultry. The result of this study may help to reduce the pressure and the concomitant effect on price of conventional protein feedstuffs.

MATERIALS AND METHODS

Proximate composition of pawpaw seed: Fresh Pawpaw seeds were obtained from commercial fruit sellers at the local market in Ilorin, Nigeria. The seeds were sun dried and ground to Dried Pawpaw Seed (DPS) and subjected to proximate analysis in accordance with standard methods of the AOAC (1990).

Experimental birds and design: One hundred (100) day-old and mixed sex broiler chickens (Arbor Acre) were obtained for the experiments. The birds were randomly

distributed into four dietary treatments of DPS at 0, 5, 10 and 15% level. Each treatment was replicated in 5 pens of 5 birds per replicate in a Completely Randomized Design (CRD). Brooding was done in an electrically heated deep litter house. Feed and water were given to the birds *ad libtum* from day-old, the experiment was conducted for 6 weeks. The birds were weighed at the beginning of the experiment and weekly thereafter, feed intake and mortality were recorded daily throughout the period of the experiment.

Haematological test: At day 42, two birds were randomly selected from each replicate for haematological test. The sampled birds were bled from punctured brachial vein to aspire 5 mls of blood from each birds out of which 2 mls was collected into bijou bottle treated with Ethylene Diamine Tetra Acetate (EDTA) for haematological assay (Bermudez and Stewart-Brown, 2003). Haematological parameters such as Red Blood Cells (RBC), White Blood Cell (WBC), Packed Cell Volume (PCV), Haemoglobin (Hb) and absolute counts of neutrophils and lymphocytes were recorded according to Jain (1986).

The Serum total protein, Blood glucose, Creatinine, Uric acid, Albumin, Alkaline phosphate, Glutamic Oxaloacetate Transaminase (GOT), Glutamic Phosphate Transaminase (GPT) level were computed according to Scott (1965).

Nutrient retention: The Nutrient retention trial was carried out at the third week of the. Known quantity of feed was given to each replicate and their faecal output were collected over 72 h period. The faecal samples were oven-dried at 70°C for 72 h and grinded prior to chemical analysis. Nutrient retention was calculated as the differences between the Nutrient intake and faecal output expressed as a percentage of Nutrient intakes.

Carcass evaluation: At the end of the sixth week, four birds were randomly selected per treatment; they were fasted overnight, weighed, slaughtered and manually de-feathered. The carcass weight, dressed weight, weight of the visceral organ and cut parts of the birds were recorded.

Data analysis: Data generated were subjected to one way Analysis of Variance (ANOVA) (Steel and Torrie, 1980). Significant differences between the treatment means were determined using the Duncan Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

The result of the proximate analysis of Dried Pawpaw Seed (DPS) (Table 1) showed that it contained 30.08% Crude Protein (CP), 34.80% Ether Extract, 1.67% Crude Fibre and Nitrogen Free Extract of 23.67%. The Ash Content was 7.11, while the moisture Content was 2.73% the dry matter content was 97.27%. DPS can be use as an alternative protein source with 30% CP for poultry since protein supplement are ingredients that contain more than 20% protein (Atteh, 2000; NRC, 1994). Oily nature of pawpaw seed reflected in the value obtained for ether extract of the DPS and this agreed with the reports of Chinoy and Padman (1996). The crude fibre of DPS is relatively low and therefore will enhance nutrient digestibility (NRC, 1994). The presence of low level of ash content indicates that the total inorganic mineral in DPS is low.

Table 1: Proximate analysis of dried pawpaw seeds*

Nutrient	Composition (%)
Crude protein	30.08
Crude fat	34.80
Crude fibre	1.67
Ash content	7.11
Dry matter	97.27
Nitrogen free extract	23.67

*Each value is an average of 3 determinations

Feed intake and weight gain were influenced ($p>0.05$) by the dietary DPS (Table 3). Highest feed intake (63.33 g/bird/day) and weight gain (20.10 g/bird/day) were observed in birds fed the diet containing 5% dietary DPS. Generally feed intake and weight gain were inversely related to dietary levels of DPS. Broilers fed 15% dietary DPS had the lowest value (38.72 and 11.18 g/bird/day, respectively) for these criteria. Feed to gain ratio ($p>0.05$) also followed similar trend as the feed intake in response to dietary DPS. This observation may be a result of intrinsic anti-nutritional factors in DPS. Increased feed intake observed in birds fed 5% DPS however, could be attributed to adequate nutrient utilization occasioned by the relatively low dietary fibre and reduced anti-nutritional factor (NRC, 1994). Protein and fat retentions were influenced by dietary DPS ($p<0.05$). Increasing dietary DPS at 15% inclusion level have significantly ($p<0.05$) adverse effect on nutrient retention of broilers. High fibre retention was obtained in dietary treatment of 5% DPS fed broilers ($p<0.05$).

Haematological value such as RBC, PCV, Hb (Table 4) were significantly affected by the treatment ($p>0.05$). There were no significant differences ($p>0.05$) in the WBC, Leucocyte and Neutrophil values in response to dietary DPS. Inclusion of DPS in the diets of broilers tended to improve their haematological competence especially at 5% dietary level. Haematological values are indirect pointers to the health of live stocks (Kecceci *et al*., 1998; Jain, 1986) and are further modified by several other factors including diets (Talebi *et al*., 2005). Most of these values recorded for DPS fed broilers are within the normal range for poultry (MVM, 1986). The value of PCV at 5% inclusion level corresponds with the findings of Nworgu *et al*. (1999). The Hb values falls within (6.0-13%) reported by Iheukwumere *et al*. (2002) but lower than the normal value (9-13) reported by (MVM, 1986). Birds fed 15 % had the lowest WBC of (10.53×10^9/1). This may be due to high levels of anti nutritional factor

Table 2: Composition of experimental diets (%)

	Diets (%)							
	Broiler Starter				Broiler Finisher			
	Inclusion levels of DPS				Inclusion levels of DPS			
Ingredients	0	5	10	15	0	5	10	15
Maize	56.50	55.70	54.85	53.10	62.00	64.00	64.00	64.00
Soyabean Meal	30.00	25.00	20.00	15.00	30.00	25.00	20.00	15.00
Dried Pawpaw Seed	0.00	5.00	10.00	15.00	0.00	5.00	10.00	15.00
Groundnut Cake	7.75	8.50	9.30	10.65	2.00	1.50	2.00	2.00
Fishmeal	2.50	2.55	2.60	3.00	3.50	3.00	2.50	3.50
Bone Meal	1.50	1.50	1.50	1.50	0.80	0.40	0.40	0.80
Oyster Shell	1.00	1.00	1.00	1.00	1.00	0.40	0.40	1.00
Methionine	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Lysine	0.10	0.10	0.10	0.10	0.15	0.15	0.15	0.15
Vit- Min Premix*	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Salt	0.30	0.30	0.30	0.30	0.20	0.20	0.20	0.20
Total	100	100	100	100	100	100	100	100
Calculated analysis								
Crude Protein (%)	23.41	23.13	22.75	22.79	22.14	21.04	20.21	20.23
Energy Kcal/Kg	2954.3	2954.7	2948.9	2933.3	3017.0	3064.7	3069.9	3071.35

*To provide the following per Kg of diet as specified by the manufacturer: vitamin A, 12500 IU; vitamin D_3 2500 IU, vitamin E 50.00 mg, vitamin $K_3$2.50 mg, vitamin B_1, 3.00 mg, vitamin B 6.00 mg vitamin B_{122} 0.25 mg; Panthotheicacid, 5 mg, nicotinicacid, 20 mg, folicacid, 1.00 mg, cholinechloride, 300 mg; manganese 100 mg, iron, 50 mg, zinc, 45 mg, copper, 2.00 mg; iodine, 1.55 mg, cobalt, 0.25 mg; selenium 0.10 mg

Table 3: Effect of different levels of Dried Pawpaw Seed (DPS) on the performance of broilers

	Inclusion Levels of DPS (%)				
Parameters	0	5	10	15	SEM
Feed Intake (g/bird/day)	48.12^{b}	63.33^{c}	49.14^{b}	38.72^{a}	4.32
Weight Gain (g/bird/day)	14.57^{b}	20.10^{c}	14.49^{b}	11.18^{a}	1.42
Feed to Gain ratio	3.30	3.17	3.39	3.46	
Protein Retention (%)	57.2^{a}	56.80^{a}	52.46^{a}	28.88^{b}	6.35
Fat Retention (%)	46.14^{b}	61.35^{a}	53.11^{b}	32.64^{b}	7.94
Fibre Retention (%)	75.92^{a}	87.17^{a}	80.13^{a}	59.60^{b}	5.02

^{a,b,c}Mean values within rows with the same superscript are not significantly different (p>0.05), SEM = Standard Error of Mean

Table 4: Effect of different levels of Dried Pawpaw Seeds on haematological indices and serum biochemistry of broilers

	Inclusion Levels of DPS (%)				
Haematological indices	0	5	10	15	SEM
PCV (%)	28.75^{a}	31.50^{b}	26.25^{a}	28.25^{a}	1.48
RBC ($x10^{12}/1$)	1.76^{b}	1.85^{c}	1.57^{a}	1.76^{b}	0.06
WBC ($x10^{9}/1$)	11.88	12.08	11.15	10.53	0.49
Hb (g/dl)	6.50^{ab}	7.85^{c}	5.43^{a}	6.03^{ab}	0.54
Neutrophil (%)	70.25	74.75	72.00	70.50	9.62
Lymphocytes (%)	29.50	25.00	29.00	28.50	1.60
Glucose (Mmol/l)	10.53^{a}	8.80^{b}	10.15^{a}	9.82^{ab}	0.35
Uric acid (Mmol/l)	0.30^{a}	0.31^{a}	0.38^{b}	0.40^{b}	0.03
Serum Protein (Mmol/l)	32.80^{b}	31.13^{b}	27.45^{a}	25.85^{a}	2.19
Albumin (Mmol/l)	8.10^{c}	11.90^{b}	12.23^{ab}	10.00^{abc}	1.07
Creatinine (Mmol/)	52.50^{a}	59.00^{b}	63.50^{b}	61.25^{b}	2.24
Alkaline-Phosphate (iu/l)	69.25	69.00	71.75	79.00	3.05
GOT (iu/l)	116.60^{a}	108.9^{a}	146.09^{b}	148.25^{b}	10.80
GPT (iu/l)	15.95^{a}	17.25^{b}	17.75^{b}	19.53^{c}	0.74

^{a,b,c}Mean values within rows with the same superscript are not significant different (p>0.05), SEM = Standard Error of Mean

present in the feed that may have activated the immune systems (Mahagan and Agrawal, 1980). The RBC values obtained showed that the diets affected the blood profile of birds. This observation agreed with the views of (Emenalom *et al*., 2009; Talebi *et al*., 2005; Madubuike and Ekeyem, 2006; Odunsi *et al*., 1999).

The results of the serum biochemical constituents (Table 4) showed that glucose, uric acid, creatinine,

Table 5: Relative weights of organ and primal cuts of broiler (g/100 g of Body Weight) fed Dried Pawpaw Seed

	Inclusion Levels of DPS (%)			
Parameters	0	5	10	15
Dress weight	96.78	97.07	95.90	93.44
Head	5.42	5.5	5.18	5.17
Neck	4.34	3.71	3.98	2.98
Back	16.56	17.68	16.48	16.38
Wings	8.62	10.17	8.38	7.62
Shanks	6.73	5.51	5.82	4.42
Thigh	8.48	8.71	8.28	7.04
Drumstick	9.24	9.70	9.46	8.71
Pancreas	0.42	0.31	0.26	0.24
Proventriculus	0.94	0.85	0.74	0.52
Liver	2.4	2.99	2.57	1.96
Gizzard	3.17	3.34	3.10	2.00
Intestine (cm)	147.5	144	137.5	118.5

GOT, GPT and serum protein varied significantly ($p<0.05$) in response to DPS inclusion in broiler diet. The values of these parameters tended to increase directly with increasing levels of DPS. High uric acid and creatinine values are a measure of amino acid degradation (Shukla and Parahaurii, 1995) and early pointer to depressed liver and kidney function (Wards *et al*., 1985). The significant differences ($p<0.05$) and elevated creatinine value as the inclusion level of DPS increase suggests depletion of tissue creatinine phosphate and this can adversely affect the muscle mass(Alleyne *et al*., 1970; Eggum *et al*., 1982). Alkaline-phosphate value was not significantly affected by dietary DPS ($p>0.05$). The values of serum protein decreases with increasing level of DPS, blood protein are usually affected by plane of nutrition (NRC, 1994). The value of the GOT and GPT are within the normal range and showed the ability of birds to withstand the effect of anti-nutritional factors which can cause liver damage (Harper *et al*., 1979). High serum values of these enzymes in this study for birds given DPS are indicative of initial stage of normal liver and kidney dysfunctions (Reitman and Frankel, 1957; Bolu *et al*., 2006). Dietary DPS did not affect the carcass and organ weight of the birds significantly ($p>0.05$) (Table 5).

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