

**EVALUATION OF JATROPHA CURCAS LEAF MEAL ON RELATIVE ORGAN CHARACTERISTICS AND HAEMATOLOGICAL INDICES OF BROILER FINISHER BIRDS.**

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**ABSTRACT**

A 21-day feeding trial was conducted to evaluate the effects of *Jatropha curcas* Leaf Meal on organ characteristics and haematological indices of broiler finisher birds. The leaves were harvested, chopped to facilitate drying in the sun for 5 days until they became crispy while still retaining the greenish colouration. The material was milled using a hammer mill with a sieve size of 3.36mm to produce leaf meal. Two broiler finisher diets were formulated to contain the *Jatropha curcas* Leaf Meal at 0% and 5.0% dietary levels respectively and were used to feed 120, 5-week-old broiler chicks with three replicates of 20 birds each per treatment in a completely randomized design (CRD). At the end of the 21<sup>st</sup> day, five birds were randomly selected from each treatment for carcass, organ weight evaluation and haematological indices. The relative organ weights were not comparable except the heart. The blood compositions of finisher broilers in terms of packed cell volume, red blood cell and haemoglobin increased with increasing dietary level of the leaf meal but the values were not significantly ( $P>0.05$ ) different from the control (%) group. With increasing dietary inclusion levels of *Jatropha curcas* leaf meal in the diet, the erythrocytic (RBC) and leucocytic (WBC, Lymphocytes and neutrophils) parameters varied without any negative significant ( $P>0.05$ ) effects. The results of this study suggest that broiler finisher birds could tolerate 5.0% dietary level of *Jatropha curcas* Leaf Meal without deleterious effects on organ characteristics and haematological indices of birds.

**Key Words:** *Jatropha Curcas* Leaf Meal, Organ Weight, Haematology, Alternative feed

**INTRODUCTION**

The unavailability of grains and the high cost of imported ingredients have made the price of commercial animal feed to increase over 300 % (Udedibia *et al.*, 1994). These problems remain the most important constraints to the expansion of commercial livestock production in Nigeria.

The need to exploit other available but neglected cheaper novel feed resources, especially those indigenous to our environment and inedible to man are urgently necessary.

*Jatropha curcas* is an indigenous tropical plant, which is predominant in Nigeria. It is a multipurpose and large drought resistant plant with several attributes as potential biofuel crop and livestock

feedstuff. It contains 37% oil and has relatively high crude protein content with specific value in livestock feeding (Axelsson *et al.*, 2011). The leaf meal has a proximate composition of 86.39% dry matter, 13.61% moisture, 19.51% crude protein, 11.93 % crude fibre, 2.08% Ether Extract, 8.47% Ash and 44.4% nitrogen free Extract. However, factors such as nutrient imbalance, improper metabolism, presence of anti-nutritional factors and toxic elements in such novel feed ingredient have been implicated in similar products (Esonu *et al.*, 2007, Emenalom *et al.*, 2009). Moreover, understanding the haematological constituents of birds feeding on some dietary inclusion of leaf meal is important, since such data indirectly reflect in the physiological responsiveness of the animals (Esonu *et al.*, 2001; Esonu *et al.*, 2007; Emenalom *et al.*, 2009). The objective of this study therefore was to determine the effect of *Jatropha curcas* leaf meal on the physiological parameters such as internal organ characteristics and haematology of finisher broiler birds in a humid tropical environment.

**MATERIALS AND METHODS**

The research was conducted at the Teaching and Research farm of the School of Agriculture and Agricultural Technology (SAAT), Federal University of Technology, Owerri, Imo State, Nigeria. Owerri is in the South-Eastern Agro-ecological zone of Nigeria in the humid tropical area of West Africa and is situated on longitude 7 01' 06" E and 7 03' 00" E and latitude 5" 28' 24" N and 5' 30' 00N and altitude of 90m. The mean annual rainfall, temperature and relative humidity are 2500mm, 26.5-27.5C and 70-80%, respectively. The dry season duration is five months and annual evaporation is 1450mm. The soil texture is sandy loam with an average pH of 5.5 (Ministry of Lands and Survey Atlas of Imo State, 1984). The leaves of *Jatropha curcas* used for this trial were harvested from the Federal University of Technology, Owerri farm and its environs. The stalks were removed and the leaves chopped to facilitate sun drying for 5 days until they become crispy while still retaining its greenish colouration. The dried leaves were then milled, using a hammer mill with a sieve size of 3.36mm to produce leaf meal. Samples of the leaf meal were then analyzed to determine the proximate composition (AOAC, 2000) and phytochemical analysis (table 1). The energy value of the meal was estimated (in KJ) according to Siddhuraju *et al* (1996) by multiplying the

percentage of crude protein, crude fat and carbohydrate by the factors 16.7, 37.7 and 16.7, respectively.

**Table 1: Proximate Phyto-Chemical Composition of *Jatropha curcas* Leaf Meal**

Proximate	Composition
Dry Matter	86.39
Moisture	13.61
Crude Protein (% DM)	19.51
Crude fibre (%DM)	11.93
Ether Extract (% DM)	2.08
Ash (% DM)	8.47
NFE (% DM)	44.40
Gross Energy (kcal/kg)	1595.40
<b>Phyto chemical analysis</b>	
Saponin (%)	5.2
Alkaloid (%)	1.80
Tannin (%)	0.26
Flavonoid (%)	0.88
Oxalate (%)	1.94
Phorbol (g/kg Dm)	3.5

### Experimental Diets

The leaf meal so prepared was used to formulate diets for broiler finisher chicks at 0% and 5.0% dietary levels respectively. Other ingredients were adjusted such that the diets were iso-nitrogenous and nutrient requirement of the broiler finisher birds met. The ingredients and chemical composition of the experimental diets are shown in Table 2.

One hundred and twenty (120), 5-week-old broiler chicks of Marshal strain were divided into two groups of 60 birds each and randomly assigned to the two treatment diets in a completely randomized design (CRD) experiment. Each treatment group was further sub-divided into three replicates of 20 birds per replicate and kept in 6m x 8m compartment. Feed and water were provided ad-libitum. Feed intake was recorded daily and the birds weighed weekly. Other routine poultry management procedures were maintained. The feeding trial lasted 21 days. At the

end of the 21 day, five birds were randomly selected from each treatment for carcass, organ weight evaluation and blood analysis. The birds were fasted for 24 hours, weighed, slaughtered and bled. Dressing percentage, weight of heart, liver, kidney and gizzard were obtained. Blood samples from the slaughtered birds were allowed to flow freely into labeled sterile universal bottles containing 1.0mg/ml ethylene-diamine tetra-acetic acid (EDTA) and 0.1mg/ml Heparin as outlined by Uko *et al.*, (2000). This was used to determine the haematological components: red blood cell (RBC), white blood cell (WBC), Haemoglobin concentration (Hb). Other haematological indices such as mean cell Haemoglobin (MCH), mean cell concentration (MCHC) and mean cell volume (MCV) were calculated from the results obtained. Data collected were subjected to statistical analysis using T-test as outlined by Snedecor and Cockran (1995).

**Table 2: composition of Finisher Broiler Experimental Diets****Dietary Inclusion Level of Jatropha Leaf Meal (%)**

Ingredients	0.0	5.0
Maize	50.00	50.00
Soybean meal	30.00	30.00
Jatropha leaf meal	0.00	5.00
Fish meal	2.00	2.00
Palm kernel meal	2.50	0.50
Wheat offal	3.00	0.50
Brewer's Dried Grain	8.00	7.50
Bone meal	3.50	3.50
TM/Vit Premix*	0.25	0.25
Methionine	0.25	0.25
Lysine	0.25	0.25
Common salt	0.25	0.25
Total	100.00	100.00

**Chemical Composition of the Experimental Diets**

Crude Protein	20.62	20.57
Crude Fibre	4.08	5.05
Ether Extract	3.23	3.98
Calcium	1.23	1.15
Phosphorus	0.51	0.57
ME (kcal/kg)	2857.85	2795.00

To provide the following per kg of feed: Vitamin A 10, 00 iu, Vitamin D<sub>3</sub>, 2000 iu, Vitamin E, 5iu; Vitamin k, 2mg; riboflavin, 4.2mg; vitamin B12, 0.01mg; pantothenic acid, 5mg; nicotinic acid, 20mg; folic acid, 0.5mg; choline, 3mg, mg, 56mg; fe, 20mg; cu, 1.0mg Vitamin D3, 1, 500iu; vitamin k, 2mg; riboflavin, 3mg, panthothenic acid, 6mg, Niacin, 15mg; chlorine chloride, 3mg, vitamin B12, 0.08, Folic acid, 4mg, mn, 8mg; 0.5mg, iodine, 1.0mg; co, 1.2mg; cu, 10mg, fe, 20mg.

**Results:** The chemical composition and the phyto-chemical analysis of *Jatropha curcas* leaf meal are presented in Table 1, while the nutrient composition of the experimental diets is shown in table 2 Data on

the carcass, relative organ weights, and haematological parameters of the treatment birds are shown in Table 3. The relative organ weights expressed as percentage of the body weight of the groups were significantly ( $p < 0.05$ ) affected by the treatments except the heart. Haematological values such as RBC, PVC and Hb were not significantly ( $p > 0.05$ ) affected by the treatments but increased slightly with increasing dietary inclusion of Jatropha leaf meal. The MCHC values of the broiler birds fed Jatropha leaf meal diets were comparable with that of the group on the control (0%) diet. The Leucocytes components (WBC, Lymphocytes and neutrophil did not differ significantly ( $p > 0.05$ ) among treatment groups.

**Table 3: Relative Organ and Haematological Characteristics of Finisher Broilers Fed *Jatropha curcas* Leaf Meal**

Relative Organ and Haematological Characteristics of Finisher Broilers Fed <i>Jatropha curcas</i> Leaf Meal				
Parameters	% Inclusion Levels Of <i>Jatropha</i> Leaf meal			T-Value
	0.0	5.0	SEM	
Live weight (g)	2135.00	1300.00	30.17	10.98
Dressed carcass (%)	86.84	55.38	2.71	11.05
Heart (%)	0.45	0.55	0.02	0.03
Liver (%)	1.89 <sup>a</sup>	2.38 <sup>a</sup>	0.08	0.52
Gizzard (%)	2.90 <sup>a</sup>	3.48 <sup>b</sup>	0.06	1.08
Kidney (%)	0.11 <sup>a</sup>	0.19 <sup>b</sup>	0.11	0.03
<b>Haemtological Indices</b>				6.10
Haemaglobin 9/100ml)	9.45	9.85	1.3	
Packed cell volume (%)	30.50	32.5	0.8	5.75
MCV (fl)	27.90	29.20	0.64	3.11
MCHC (%)	31.10	29.80	0.86	3.5
White Blood Cell (X10 <sup>4</sup> /L)	8.60	9.30	0.27	3.34
Neutrophil (%)	17.50	16.50	2.40	6.44
Lymphocytes (%)	82.50	85.50	3.40	3.38
Eosinophils (%)	2.0	1.0	0.15	1.05
Monocytes (%)	2.0	3.0	0.85	5.01

ab means on the same row with different superscripts and significantly different

## DISCUSSION

The crude protein value *Jatropha curcas* leaf meal was 19.51% on dry matter basis, this suggests that it is a potential source of nutrient like other tropical shrubs (D'Mello et al 1995). The relatively high level of crude fibre (11.93%) of the leaf meal could be an advantage in the maintenance of a healthy gastrointestinal tract of animals, thus indicating that this leaf meal can also serve as a fibre source in the diet of non-ruminant animals. The phyto-chemical analysis of *Jatropha curcas* leaf meal showed it contains some anti-nutritional factors (ANFs) such as tannis, saponin, oxalate, alkaloid, flavonoid and phorbol esters which are capable of depressing nutrient digestion, absorption and retention (Ani and Omeje, 2011). Saponin is linked with reduction of palatability and intake of nutrients (Makhtar and Becker, 1997). High concentration of Oxalate affects calcium absorption, phytate is implicated in decreasing protein digestibility by forming complexes and also interacting with enzymes such as trypsin and pepsin (Reddy and Pierson, 1994), it also forms complexes with divalent minerals thereby decreasing the bioavailability of these elements for absorption (Oboh et al., 2003). Phorbol esters are known for their inflammatory action resulting in irritation and toxicity (Goel et al., 2007). Organ weight is an index of nutrient retained by the birds (Esonu et al., 2008). The observed trend in the organ weights (Liver, Kidney and Gizzard) is probably as a consequence of increased activity of these organs in detoxifying the anti-nutritional factors ingested by birds on the diet containing *Jatropha curcas* leaf meal

(Amaefule and Obioha, 2001, Hemening, 1992). The varied but non-significant ( $p < 0.05$ ) haematological values recorded in this study are within normal range (Emenalom et al., 2009) and indicate a normal health condition of the birds. The RBC, PVC and Hb values of birds increased with increasing dietary inclusion level of *Jatropha curcas* leaf meal with the control recording lower non-significant ( $P > 0.05$ ) values. This is contrary to the report of Madubike and Ekenyem (2006). This tend to confirm the report that diets affect the blood profile of birds (Talebi et al., 2005; Odunsi et al., 1999) and implies that the inclusion of *Jatropha curcas* leaf meal had a positive effect on the relative quantity of blood cells as well as total volume of blood. The values of WBC and their differential counts were within normal range (Emenalom et al., 2009). White blood cell in the avian species in general serves phagocytes functions similar to those of their mammalian counterparts (Campbell and Coles, 1986) and differential leucocytes were used as indicators of stress response and sensitive biomarkers crucial to immune functions (Graczyk et al., 2003). Results from this experiment suggest that up to 5.0% dietary level of *Jatropha curcas* leaf meal could be utilized by broiler finishers without adverse effect on relative organ characteristics and haematological parameters.

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