Haematological Characteristics and Organoleptic Test of Feeding Different Levels of Pawpaw (Carica papaya) Leaf Meal on Finisher Broiler Birds

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Abstract

Sixty four weeks old broiler birds were used to evaluate the haematological characteristics and organoleptic test of feeding different levels of Carica papaya leaf meal (CPLM) on finisher broiler birds. The birds were divided into four treatments with three replicates per treatment. Each replicate contained five birds. Broiler finisher rations were formulated in which CPLM was incorporated at levels of 0\%, 5\%, 15\%, and 20\% in the control T\textsubscript{1}, T\textsubscript{2}, T\textsubscript{3} and T\textsubscript{4} diets respectively. At the tenth week of the feeding trial, two birds were randomly selected from each replicate and 10 ml of blood were collected from each bird with 10 ml sterile syringe. The blood sample collected was used to assess the haematological values of the experimental birds. However, the results obtained from the experiment, indicated that the haematological values of the experimental birds decreased as the inclusion levels of CPLM increased in their diets even though it did not show any deleterious effect on the birds. All data were subjected to analysis of variance (ANOVA) for a completely randomized design. The result also showed that above 15\% (CPLM) in finisher broiler birds’ diet, the haematological values were affected which invariably resulted to the poor performance of the birds placed at the high level of CPLM. However, CPLM appears to be the optimal inclusion level in finisher broiler birds.

Keywords: Carica papaya leaf meal, Performance, Organ weights, Broiler finisher birds.

1. Introduction

The high cost of poultry feeds in Nigeria precipitated by the ever increasing cost of feed ingredients, especially protein sources has resulted in declining productivity and profitability of intensive poultry production system. This has caused the prices of poultry products (egg and meat) to rise far beyond the purchasing ability of an average Nigerian (Onyimoni and Onu, 2009). 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 biological values that can help in supplementing the costly conventional protein sources. Leaf meal supplementation have been included into the diets of poultry as means of reducing high cost of conventional protein sources and to improve profit margin (Odunsi et al., 1999). The incorporation of protein from leaf sources in diets for broilers is gaining grounds because of its availability, abundance and relatively reduced cost. Leaf meals do not only serve as protein sources but also provide some necessary vitamins, minerals and also oxycarotenoids which cause yellow colouration in broiler skin, shank and egg yolk (Opara, 1996). Vegetable-based feeds are rich sources of essential plant amino acids, vitamins, minerals, and antioxidants (Omenka and Anyasor, 2010).

Paw-paw is a plant native to tropical America. It is popular in the tropics and sub-tropics because of its easy cultivation, rapid growth, quick economic returns and easy adaptation to diverse soils and climates (Amadinze et al., 2016). The fruit is high in vitamins (A, B\textsubscript{1}, B\textsubscript{2}, and C) and minerals (Calcium, Phosphorus, Potassium and Iron), low in sodium, fat, calories and contains practically no starch (Unigwe et al., 2014). Paw-paw latex contains proteolytic enzymes papain, chymo-papain A and B, and papaya peptidase A (Amadinze et al., 2016) and chitinase enzyme (Savon, 2005). Pawpaw plant (Carica papaya) is the most natural source of papain, an effective natural digestive
aid which breaks down protein and cleanses the digestive tract (Tungland and Meyer, 2002). Pawpaw leaf has been used in ethno-medicine application for the treatment of several ailments in Nigeria. This study, therefore, investigated the proximate composition of paw-paw leaf and its effect on the growth performance of broiler chickens.

2. Materials and Methods

2.1 Experimental Site, Source, Processing and Proximate Composition of Paw-Paw Leaf

The study was conducted at the poultry unit of the Teaching and Research Farm, Imo State Polytechnic Umuagwo, Nigeria. The paw-paw leaves were purchased from a commercial farm in Imo State. The leaves were harvested from paw-paw trees around the poultry unit. The leaves were separated from the stalk, washed, drained, chopped and dried at room temperature for 4-6 days, till they were crispy at constant weight while still retaining the green colour. The crispy leaves were ground and used for compounding of the diets. The ground leaves were subjected to proximate analysis in accordance with standard methods of AOAC (2001).

2.2 Experimental Animals, Design, Diets, Duration and Management

Sixty (60) four weeks old Anak broiler birds were purchased from a commercial farm in Imo State. The birds were randomly allotted to four treatments in a completely randomized design. Each treatment was replicated thrice, having five chicks each. The treatments were as below:

- **T1**=Diet without *Carica papaya* leaf meal (CPLM) (control),
- **T2**=Diet with 5% CPLM,
- **T3**=Diet with 10% CPLM,
- **T4**=Diet with 15% CPLM

The above feeding trial lasted for 5 weeks (35 days). The poultry house was cleaned, washed and disinfected using Isol (cremol) and diazintol, allowed without stocking for 2 weeks. On arrival, the four weeks old broiler birds were served with a solution of glucose and vita-lyte to serve as anti-stress after which they were served commercial finisher diet for one week to stabilize the birds. Then the birds were randomly assigned to all the treatments and replicates. All routine vaccinations and biosecurity measures were carried out. The birds were fed twice daily *ad libitum* by 7.30am and 5.30pm. Clean drinking water was also offered to them *ad libitum*. The litter materials were replaced with fresh ones at intervals.

Treatment 1 had no CPLM and served as the control. The diets were isonitrogenous and isocaloric containing 21% CP and 2800 Kcal_ME/kg (Table 1). The birds received feed and water *ad libitum* for the 35 days the feeding trial lasted. Initial weights of the birds were taken at the start of the experiment and weekly thereafter. Feed intake and mortality were recorded over the period. On the 35th day, three birds per treatment (one per replicate) were randomly picked and processed for carcass and organ performance in line with earlier procedure (Darly et al., 2007). Data obtained from the response variables were subjected to a one way analysis of variance (ANOVA) according to the procedure of Steel and Torrie (1980). Significantly different means were separated using the method of Gordon and Gordon (2004). Proximate composition of the PLM and the diets were performed using the procedure of AOAC (2001).

3. Results and Discussion

The result of the proximate composition of the CPLM is presented in Table 2. Result show that the crude protein of PLM is 30.12%. This value exceeds the 17.3% crude protein value reported for *Microdesmis puberula* by (Esonu et al., 2002), 25.10% crude protein value for cassava leaf meal reported by (Ihekwumere et al., 2008), 24.06% crude protein for neem leaf meal reported by (Onyimonyi et al., 2009) and 22.34% crude protein value for mucuna leaf meal reported by (Emenalom et al., 2009). The high crude protein value of CPLM further suggests its utilization as a protein supplement in diets for finishing broilers. The crude fibre of CPLM was 5.60% which was lower than the 24.8, 11.40, 12.00 and 12.93% observed for *Microdesmis puberula*, cassava leaf meal, neem leaf meal and mucuna leaf meal by (Ihekwumere et al., 2002; Ihekwumere et al., 2008; Onyimonyi et al., 2009; Emenalom et al., 2009) respectively. The relative low crude fibre of CPLM makes it a potential feed stuff for monogastrics that ordinarily have little capacity to digest fibre.

The results of the haematological indices of broiler birds showed an improved performance in all the parameters measured as the level of CPLM in the diets increased. The packed cell volume (PCV), White blood cell (WBC) and Haemoglobin (Hb) values obtained in this study conform to the normal value of broiler birds of their age (Merck, 1979). The Hb value of 8.09-10.17 obtained in this study compare favourably with 6.0-13 and 8.60-10.70 values reported by (Ihekwumere et al., 2002; Okonkwo and Ahaotu, 2014) respectively. The PCV value of 25.97-31.0 obtained in this study was higher than 26.9-27.4 reported by (Fasuyi and Nonyerem, 2007) and lower than 28.0-41.5 recorded by (Nworgu et al., 2007) on -
Table 1: Percentage Composition of the Experimental Diet

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>T₁ (0%)</th>
<th>T₂ (0.5%)</th>
<th>T₃ (1.5%)</th>
<th>T₄ (2.0%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cassava chips</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Maize</td>
<td>7</td>
<td>7</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Groundnut cake</td>
<td>25</td>
<td>24.5</td>
<td>23.5</td>
<td>23.0</td>
</tr>
<tr>
<td>Palm kernel cake</td>
<td>19</td>
<td>19</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>Carica papaya Leaf meal</td>
<td>0</td>
<td>0.5</td>
<td>1.5</td>
<td>2.0</td>
</tr>
<tr>
<td>Fish meal</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Bone meal</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Salt</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
</tr>
<tr>
<td>Lysine</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
</tr>
<tr>
<td>Methionine</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
</tr>
<tr>
<td>Vitamin premix</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Crude protein%</td>
<td>20.47</td>
<td>20.44</td>
<td>20.28</td>
<td>20.20</td>
</tr>
<tr>
<td>Energy kcal/kg</td>
<td>2850.61</td>
<td>2844.20</td>
<td>2831.39</td>
<td>2824.99</td>
</tr>
<tr>
<td>Crude fibre</td>
<td>3.944</td>
<td>3.949</td>
<td>3.959</td>
<td>3.964</td>
</tr>
</tbody>
</table>

Provided the following per kg of feed: vitamin A, 10,000 μg; vitamin D₃, 2,000 μg; vitamin E, 6 μg; vitamin K, 2 mg; riboflavin, 4.2 mg; vitamin B₁₂, 0.01 mg; pantothenic acid, 5 mg; nicotinic acid, 20 mg; folic acid, 0.5 mg; choline, 3 mg; Fe, 20 mg; mg, 56 mg, Cu, 1.0 mg; Zn, 5.0 mg; Co, 1.25 mg; iodine, 0.8 mg.

Table 2: Proximate Composition of the Diet and CPLM

<table>
<thead>
<tr>
<th>Parameters</th>
<th>T₁</th>
<th>T₂</th>
<th>T₃</th>
<th>T₄</th>
<th>CPLM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry matter</td>
<td>87.80</td>
<td>89.00</td>
<td>87.20</td>
<td>90.00</td>
<td>89.80</td>
</tr>
<tr>
<td>Crude fibre</td>
<td>4.90</td>
<td>5.12</td>
<td>5.27</td>
<td>5.38</td>
<td>5.60</td>
</tr>
<tr>
<td>Ether Extract</td>
<td>0.20</td>
<td>1.20</td>
<td>2.0</td>
<td>1.40</td>
<td>1.20</td>
</tr>
<tr>
<td>Ash</td>
<td>10.03</td>
<td>10.02</td>
<td>10.49</td>
<td>10.62</td>
<td>8.45</td>
</tr>
<tr>
<td>Nitrogen Free Extract</td>
<td>52.01</td>
<td>51.29</td>
<td>47.52</td>
<td>49.99</td>
<td>44.43</td>
</tr>
</tbody>
</table>

broiler birds. The increasing trend of Hb and WBC as the levels of CPLM in the diets increased could be attributed to increased production of leucocytes in the hematopoietic tissue of the birds. The leucocytes, however, function in the production of antibodies and chemical substances serving as defense against infection. This could have helped boost the birds’ immune system and its’ ability to perform well under stressful conditions and however, may have been responsible for the improved performances recorded as inclusion levels of CPLM increased.

The results of the various parameters measured were presented in Table 3. The pack cell volume values obtained were 25.97, 26.27, 29.97, and 31.00% for birds on diets T₁, T₂, T₃, and T₄ respectively. There was significant difference (p<0.05) between T₁ and T₂ respectively on PCV values, however, T₂ and T₃ differed (p<0.05) significantly among themselves and had lower value among T₁ and T₂. Haemoglobin (Hb) also followed the same trend like the pack cell volume (PCV) as shown in Table 3. Red blood cell count (RBC), exhibited no significant difference (p>0.05).

The values obtained for white blood cell count (WBC), were 4.27, 4.50, 5.40 and 6.37 for T₁, T₂, T₃ and T₄ respectively. The values for birds on diet T₄ (20%) Carica papaya leaf meal was higher (p<0.05) than the values obtained from T₁ to T₃, (0 to 15% CPLM) respectively. However, T₄ (20% CPLM) was highest (p<0.0.5) of all values obtained from other treatments. However, values obtained from PCV was highest in T₂ followed by other treatments (p<0.05). Clothing time, T₄ was the longest, while T₁ had the lowest, (p<0.05) among the treatments.

From the organoleptic indices of meat of finisher broilers fed varying dietary levels of Pawpaw –
CPLM, colour, tenderness and general acceptability were significantly different (p<0.05) in all treatments (Table 4). No significance was recorded in taste parameter. The results of the meat strength obtained in this study showed that, as the level of CPLM in the diets increased the meat strength decreased. The broiler meat from T4 (20%) was deformed at a very low load of 350 Newton as against the 2100 Newton of load that deformed the meat of control diet. The result agreed with the report of Health Watch (2002) that CPLM contain an active ingredient papain, which is a tenderizer and can be used as a meat softener. The organoleptic indices measured showed an increasing value as the levels of CPLM in the diets increased. The spectacular finding here is the significant increase in tenderness of the meat of broiler birds fed 20% dietary level of CPLM. This result proved CPLM to be a tenderizer and could be employed in cooking meat. The significant improvement in colour as level of CPLM increased agrees with earlier report that leaf meals contain oxycarotenoids which impact yellow colour to broiler meat (Opara, 1996). The general acceptability of the meat is a further confirmation that the eating quality of the meat of broiler birds on CPLM diets has been improved.

4. Conclusion
The incorporation of CPLM at measured quantities into broiler finisher diets had nutritional benefits without any deleterious effects on the parameters measured. There were no recorded infections or any disease conditions even at the highest dietary level of 20.0% in broiler finisher diets. Carica papaya leaf meal therefore contributes significant amount of crude protein that would promote normal growth and result in low feed cost per kilogram weight gain.

References
Ahaotu et al...Haematological Characteristics and Organoleptic Test of Feeding Different Levels of Pawpaw (Carica papaya) Leaf Meal on Finisher Broiler Birds


