HAEMATOLOGICAL PROFILE AND SERUM BIOCHEMICAL INDICES OF WEANED RABBITS FED PAWPAW LEAVES (CARICA PAPAYA) AS SUPPLEMENTS TO CORN – SOYBEAN MEAL BASAL DIET

A. J. HENRY, P. O. OZUNG AND P. I. UDHO

(Received 22 August 2016; Revision Accepted 20 September 2016)

ABSTRACT

This study was carried out to determine the haematological profile and serum biochemical indices of rabbits fed pawpaw (Carica papaya) leaves as feed supplement to a corn – soybean meal basal diet. The study involved thirty six (36) cross bred (New Zealand White X Chinchilla) mixed sex weaned rabbits of five - six weeks old, with average weight of 166.69±0.02 g. The rabbits were divided into two dietary treatments comprising eighteen (18) rabbits each. The dietary treatments were designated as T1 and T2 for rabbits fed fresh pawpaw leaves and wilted pawpaw leaves, respectively. The corn – soybean meal basal diet contained 15% crude protein and 2488.68 Kcal/Kg metabolizable energy. The feeding trial lasted six weeks, during which period feed and water were provided ad – libitum. The studentized t-test was used compare the results from both dietary treatments. Results obtained from this study revealed that the haematological profile and serum biochemical indices of rabbits recorded no significant (P > 0.05) differences between dietary treatments. The study concludes that pawpaw leaves either fresh or wilted when fed as supplements to corn – soybean meal basal diets will not pose adverse effects on the blood characteristics of rabbits.

KEYWORDS: Rabbits, Pawpaw leaves, haematology, serum biochemistry

INTRODUCTION

Feed scarcity has remained a major limitation to livestock production and productivity (Agbede and Aleotor, 2003). The high cost of animal feeds precipitated by the ever increasing cost of feed ingredients has resulted in poor nutrition leading to declining productivity of animals in developing nations like Nigeria (Nodu et al., 2014). According to Fetuga (1997) there is a disappointing rate and low level of performance in the Nigerian livestock industry, due to high cost of feeds, poor quality feeds and inefficiency in production and distribution in the feed industry. The low level of livestock production has affected adequate protein intake. However, intensive rabbit production and domestication can help bridge the meat supply gap in Nigeria and ensure animal protein adequacy.

Rabbits are monogastric herbivores with post – gastric digestion that can effectively utilize fodder that is high in fibre such as grasses and legumes (Adegbola et al., 1985). Rabbits have the ability to convert forages and other farm by – products that are not consume directly by humans into highly nutritious meat. They are highly prolific and quite cheap to produce, when compared with other farm animals. Efficient rabbit production is dependent on adequate and proper nutrition (Stanford, 1979). Aduku and Olukosi (1990) reported that rabbits require a crude protein level of 12 – 17 % and energy level of 2,390 – 2500 Kcal/Kg ME for optimum growth in the tropics. Fielding (1991) also reported a crude protein level of 16 – 18 % as optimum for growing rabbits.

There is the growing trend on the use of non – conventional feed ingredients in livestock feed formulation. Stanford (1979) reported a wide range of feedstuffs that rabbits can utilized, including non – conventional ingredients and kitchen waste materials. One of the promising non – conventional feed materials is pawpaw (Carica papaya) leaves. Pawpaw plant is popular in the tropics and sub – tropics because of its adaptation to diverse soils and climate (Campbell, 1984). The leaves are rich sources of proteolytic enzymes, papain and chymopapain (Poulter and Caygil, 1985). Fresh pawpaw leaves could serve as antiseptic, while the dried leaves are used as tonic and blood purifier (Atta, 1999). Some researchers have documented the utilization of sun cured pawpaw leaf meal in broiler and rabbit diets, respectively (Onyimonyi and Ernest, 2009; Ozung et al., 2012 and Henry et al. 2013). Also, the anti – inflammatory effect of the ethanolic extract of Carica papaya leaves has been used to investigate induced arthritis in rats (Owoleye et al. 2008).

Research findings with pawpaw leaves in animal feeding trials are not totally satisfactory, hence the main thrust of this study. This study was therefore designed to determine the effect of fresh and wilted pawpaw leaves fed as supplements to a corn – soybean meal basal diet on the haematological profile and serum biochemical indices of rabbits in a tropical environment.

A. J. Henry, Department of Animal Science, Faculty of Agriculture, Forestry & Wildlife Resources Management, University of Calabar, Calabar, Nigeria.

P. O. Ozung, Department of Animal Science, Faculty of Agriculture, Forestry & Wildlife Resources Management, University of Calabar, Calabar, Nigeria.

P. I. Udoh, Department of Animal Science, Faculty of Agriculture, Forestry & Wildlife Resources Management, University of Calabar, Calabar, Nigeria.
MATERIALS AND METHODS

Location of study:
The study was carried out at the Rabbitry Unit of the Teaching and Research Farm, Department of Animal Science, University of Calabar, Calabar, Nigeria. Calabar is a tropical environment located at latitude 3°N and longitude 7°E with a land mass of 233.2 square miles (604Km²), average annual rainfall of 1,830mm and average temperature of 24° - 30°C as well as relative humidity ranging between 70 and 80% (Akpan et al., 2006).

Experimental animals and management:
A total of thirty six (36) cross bred (New Zealand X Chinchilla) weaned rabbits (5 – 6 weeks old with average weight of 166.69±0.02 g) of mixed sexes were used in this study. The animals were housed in wooden cages measuring 65 X 65 X 65 cm³ and raised 71 cm from the ground level. Before the animals were brought into the rabbitry, the cages were thoroughly washed and disinfected with saponated cresol and allowed to dry for seven days. The floor of each cage was covered with wire mesh to allow for the passage of waste materials. Feed and water troughs were provided in each cage, while the feed and water were provided ad – libitum. The rabbits were caged individually in clearly marked cells. The feeding trial lasted six weeks.

Test ingredient (Pawpaw leaves):
Fresh pawpaw leaves were harvested from mature pawpaw plants within the University Staff Quarters. The pawpaw leaves were divided into two categories, namely: Dietary treatment T₁ comprised of fresh pawpaw leaves that were harvested and fed to the rabbits and T₂ where the pawpaw leaves were harvested and allowed to wilt (by air – drying at room temperature) for 24 hours before being served to the rabbits.

Experimental diets:
The pawpaw leaves served as sole supplemented forage (without any other forage) to a corn – soybean meal basal diet that was formulated to meet the nutrient requirements of weaned rabbits. The diets were basically presented as follows: T₁ (Basal diet + fresh pawpaw leaves) and T₂ (Basal diet + wilted pawpaw leaves). Each rabbit was served a uniform amount of 100 g of pawpaw leaves across all the treatments, while the basal diet was offered ad – libitum. The gross composition of the basal diet is presented in Table 1.

### Table 1: Gross composition of the basal diet

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>% Composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow maize (Corn)</td>
<td>38.00</td>
</tr>
<tr>
<td>Soybean meal</td>
<td>26.00</td>
</tr>
<tr>
<td>Rice husk</td>
<td>25.00</td>
</tr>
<tr>
<td>Wheat offal</td>
<td>6.45</td>
</tr>
<tr>
<td>Palm oil</td>
<td>1.00</td>
</tr>
<tr>
<td>Bone meal</td>
<td>3.00</td>
</tr>
<tr>
<td>Mineral/vitamin premix</td>
<td>0.30</td>
</tr>
<tr>
<td>Common salt (NaCl)</td>
<td>0.25</td>
</tr>
<tr>
<td>Total</td>
<td>100.00</td>
</tr>
<tr>
<td>Calculated analysis:</td>
<td></td>
</tr>
<tr>
<td>% Crude protein</td>
<td>15.00</td>
</tr>
<tr>
<td>% Crude fibre</td>
<td>9.89</td>
</tr>
<tr>
<td>ME (Kcal/kg)</td>
<td>2,488.68</td>
</tr>
</tbody>
</table>

Blood collection:
Blood collection was done at end of the 6th week of feeding trial. Blood samples were obtained from the prominent ear vein with the aid of a hypodermic needle and syringe. Two blood samples each were collected per rabbit; one set of the blood samples was collected into plastic bottles containing Ethylene Diamine Tetra acetic acid (EDTA) for haematological profile determinations while the other sample was collected into plain sterile bottles (without EDTA) for the determination of serum biochemical indices. All haematological parameters were determined by conventional laboratory methods of Baker and Silverton (1982); Bitto and Gemade (2001), while serum biochemical indices were determined by methods described by Ochei and Kolhathar (2007).

Statistical analysis:
All data obtained in this study were subjected to statistical analysis using the studentized t – test for comparing the mean values between blood parameters of rabbits fed fresh pawpaw leaves and wilted pawpaw leaves, respectively.

RESULTS AND DISCUSSION
Results for haematological profile and serum biochemical indices of weaned rabbits fed fresh and wilted pawpaw leaves as feed supplements to a corn – soybean meal basal diet are presented in Tables 2 and 3, respectively.
Haematological profile of weaned rabbits fed pawpaw leaves as feed supplement:

Results of haematological parameters were not statistically (P > 0.05) affected by dietary treatments (Table 2). The results for haemoglobin concentration in this study were 8.92 g/dl for the fresh pawpaw leaves treatment and 10.21 g/dl for the wilted pawpaw leaves, respectively. The haemoglobin value for the wilted pawpaw leaves was within the normal ranges 10 – 15 g/dl and 10 – 17.5 g/dl reported by Aduku and Olukosi (1990); Flecknell (2000) and Medirabbit (2011) for rabbits. However, the value for the fresh pawpaw leaves was lower than the normal range 10 – 15 g/dl for rabbits. The variation in haemoglobin contents could be attributed to the form of pawpaw leaves served to the rabbits. The anti – nutrients in the fresh pawpaw leaves might have adversely affected the haemoglobin content even though the rabbits showed no obvious signs of toxicity; while the normal haemoglobin content in the wilted leaves indicated that such leaves were quite safe for the normal physiological function of haemoglobin such as transport of oxygen and carbon (iv) oxide to and from tissues of the body of the rabbits (Njidda et al., 2006). The leucocyte counts obtained in this study (12.99 and 13.18 x10³/L) for fresh and wilted pawpaw leaves, respectively were slightly higher than the normal range of leucocytes (5.00 - 12.00 x10³/L) for rabbits reported by Medirabbit (2011). The values were also higher than the range 3.10 – 3.97 x10³/L reported by Bitto et al. (2006) for rabbits fed pawpaw peel meal based – diets. The differences in leucocyte contents may be attributable to inherent medicinal properties of pawpaw leaves used in this study, especially as there was no record of mortality. This explains an effective anti-body production and better disease resistance and immunity by the rabbits (Nwosu, 1979; Mbanasor et al. 2003). According to Ihedioha (2008) leucocyte counts are of immense clinical importance as lymphocytes are responsible for immune – mediated defense of the body. The platelet counts recorded in this study were 113.50 and 120.50 x10³/L for rabbits fed fresh and wilted pawpaw leaves respectively. The values were however lower than the normal range (250.00 – 600.00 x10³/L) for rabbits reported by Medirabbit (2011). The erythrocyte counts were 3.95 and 4.50 x10¹²/L respectively for fresh and wilted pawpaw leaves, which were within the range 4.00 – 8.00 x10¹²/L reported by Medirabbit (2011), but lower than the range 4.42 – 5.13 x10¹²/L reported by Elim and Oguike (2011) for female rabbits fed Aspilia africana leaf meal. The differences in values could be attributed to different test materials and ages of rabbits in the separate studies. Furthermore, the mean corpuscular volume was between 71.03 and 69.07 fl for rabbits fed fresh and wilted pawpaw leaves,

### Table 2: Haematological profile of weaned rabbits fed pawpaw leaves as feed supplements

<table>
<thead>
<tr>
<th>Parameter</th>
<th>T₁</th>
<th>T₂</th>
<th>SEM</th>
<th>LOS</th>
<th>Ref. ranges*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haemoglobin (g/dl)</td>
<td>8.92</td>
<td>10.21</td>
<td>0.40</td>
<td>NS</td>
<td>10.00 – 15.00</td>
</tr>
<tr>
<td>Leucocytes (x10³/L)</td>
<td>12.99</td>
<td>13.18</td>
<td>0.22</td>
<td>NS</td>
<td>5.00 – 12.00</td>
</tr>
<tr>
<td>Platelets (x10³/L)</td>
<td>113.50</td>
<td>120.50</td>
<td>0.93</td>
<td>NS</td>
<td>250.00 – 600.00</td>
</tr>
<tr>
<td>Erythrocytes (x10¹²/L)</td>
<td>3.95</td>
<td>4.50</td>
<td>0.26</td>
<td>NS</td>
<td>4.00 – 8.00</td>
</tr>
<tr>
<td>MCV (fl)</td>
<td>71.03</td>
<td>69.07</td>
<td>0.49</td>
<td>NS</td>
<td>60.00 – 69.00</td>
</tr>
<tr>
<td>MCHC (%)</td>
<td>33.35</td>
<td>33.49</td>
<td>0.13</td>
<td>NS</td>
<td>30.00 – 35.00</td>
</tr>
<tr>
<td>MCH (pg/cell)</td>
<td>23.69</td>
<td>23.12</td>
<td>0.27</td>
<td>NS</td>
<td>19.00 – 22.00</td>
</tr>
</tbody>
</table>

T₁: Fresh pawpaw leaves and T₂: Wilted pawpaw leaves
SEM: Standard error of means
LOS: Level of significance (P > 0.05)
MCH: Mean corpuscular haemoglobin
MCHC: Mean corpuscular haemoglobin concentration
MCH: Mean corpuscular haemoglobin

*Ref. ranges obtained from Medirabbit.com (http://www.medirabbit.com/EN/haematology/bloodchemistry.htm)

### Table 3: Serum biochemical indices of weaned rabbits fed pawpaw leaves as feed supplements

<table>
<thead>
<tr>
<th>Parameter</th>
<th>T₁</th>
<th>T₂</th>
<th>SEM</th>
<th>LOS</th>
<th>Ref. ranges*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total protein (g/dl)</td>
<td>5.20</td>
<td>5.77</td>
<td>0.27</td>
<td>NS</td>
<td>5.40 – 7.50</td>
</tr>
<tr>
<td>Urea (mg/dl)</td>
<td>10.09</td>
<td>11.78</td>
<td>0.46</td>
<td>NS</td>
<td>20.00 – 45.00</td>
</tr>
<tr>
<td>Albumin (g/dl)</td>
<td>2.79</td>
<td>2.58</td>
<td>0.16</td>
<td>NS</td>
<td>2.70 – 5.00</td>
</tr>
<tr>
<td>Globulin (g/dl)</td>
<td>2.41</td>
<td>3.19</td>
<td>0.31</td>
<td>NS</td>
<td>1.50 – 2.70</td>
</tr>
<tr>
<td>Albumin: globulin</td>
<td>2.33</td>
<td>0.82</td>
<td>0.43</td>
<td>NS</td>
<td>0.70 – 1.89</td>
</tr>
</tbody>
</table>

T₁: Fresh pawpaw leaves and T₂: Wilted pawpaw leaves
SEM: Standard error of means
LOS: Level of significance (P > 0.05)

*Ref. ranges obtained from Medirabbit.com (http://www.medirabbit.com/EN/haematology/bloodchemistry.htm)
The values were in agreement with the chemical studies’ richness in protein. This suggests a proper functioning of and some 

Boca, CRC statistically (P > 0.05) affected HENRY, P. O. OZUNG AND P. I. UDOH – soybean 


Rabbit – This diets. 

ometry. The serum total protein reported by – Comparative 

185–187. 

65. 

6. Papaya. The power of garlic. Cardiovascular 

Handbook on Tropical Crops. 

fed fresh pawpaw 

62 

meal - 

34.00 fl reported by Bitto 

Introduction 

c 247. 

– 

– 

– 

2.79 and 

basal diets without 

The urea content was 10.09 mg/dl in the rabbits fed raw pawpaw leaves and 11.78 mg/dl in rabbits fed the wilted pawpaw leaves, respectively. These values were lower than the range 20 – 45 mg/dl reported by Medirabbit (2011). The differences in urea content could be attributed to variation in ages of rabbits in the different ecological zones. High urea level is an indication of low protein quality (Esonu et al., 2001). The low urea levels in this study revealed that the corn – soybean meal basal diet and pawpaw leaves were rich in protein with a corresponding positive effect in the proper functioning of the kidneys. The albumin values (2.79 and 2.58 g/dl for rabbits fed fresh and pawpaw leaves, respectively) were comparable with the normal clinical range (2.70 - 5.00 g/dl) for apparently healthy rabbits reported by Medirabbit (2011). This suggests a proper functioning of the liver of rabbits fed pawpaw leaves. Furthermore, the globulin concentration was 2.41 and 3.19 g/dl respectively for rabbits fed fresh and wilted pawpaw leaves. These values were within the range 2.50 – 4.50 g/dl given by Burke (1994) for rabbits. All the serum biochemical indices in this study recorded no significant differences between dietary treatments, implying that pawpaw leaves (either fresh or wilted) will not impact negatively on the serum biochemistry of rabbits.

CONCLUSION

Results obtained in this study have shown that pawpaw leaves can be utilized by weaned rabbits as feed supplement in corn – soybean meal basal diets without adverse effects on their haematological profile and serum biochemical indices.

RECOMMENDATION

It is therefore recommended that farmers can supplement basal diets with either fresh or wilted pawpaw leaves for rabbits. These leaves have been identified as forage for rabbits that could be used alongside other well-known forages like Tridax procumbens and Gliricidia sepium for rabbits in the tropics.

REFERENCES


HAEMATOLOGICAL PROFILE AND SERUM BIOCHEMICAL INDICES OF WEANED RABBITS


