Sexual Dimorphism in the Carcass Traits of Rabbits in Humid Tropics

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Abstract

This study was carried out to investigate the carcass characteristics of male and female rabbits raised in a humid tropical environment. Forty eight (48) male and female rabbits were used for this experiment. The experiment was carried out at the rabbitry unit of the Department of Animal and Environmental Biology, Adekunle Ajasin University, Akungba-Akoko, Ondo State. At 12 weeks of age, all the rabbits were weighed and slaughtered. Hot carcass, giblets, inedible carcass were measured. Data obtained from the measurements was analysed using SAS 2007. The hot carcass weight of male rabbits was higher than that of female rabbits. Sexual dimorphism was observed in the total giblets weights and the relative percentage of the giblet weight to pre-slaughter weights. Female rabbits had higher total giblets weights than male rabbits. The effect of sex was also significant on the weight of inedible carcass. However, the relative percentages of the inedible carcass weight to pre-slaughter weight were statistically similar between male and female rabbits. Nevertheless the edible carcass weight of male rabbits was significantly higher (1339.75 ±12.58g) than that of female rabbits (1221.46 ±10.29g). The dressing yield of the male rabbits (60.33%) was higher than the yield of female rabbits (58.48%). However, sexual dimorphism was not observed in the weight of thorax parts of the rabbits. Female rabbits had heavier loin (309.40 ±11.50g) than the male rabbits (271.21. ±12.85g). Sexual dimorphism also existed in the hind leg weight of rabbits. Male rabbits also had higher hind leg weight than the female. Male rabbits had better carcass traits in the humid tropics.

Key words: Sex, Carcass Traits, Rabbit, Humid tropics

Introduction

Rabbit meat is characterized by a high protein, low fat and cholesterol contents and it is considered as a delicacy and a healthy food product (Dalle Zotte, 2000). Rabbits have a number of other characteristics that might be advantageous to subsistence farming system, such as their small body size, short generation interval with a relatively short gestation period average of 30-31 days. They have high growth rate, high feed efficiency, an early marketing age and require small land area (Ortiz-Hernandez and Rubio-Luzano, 2001). Carcass traits are influenced by the adult weight and the maturity of rabbits at the age of slaughter (Piles et al., 2000). Szendro et al. (2004) reported that the selection for carcass traits is an effective tool for meat type rabbit.
According to Ghosh and Mandal (2008), sexual dimorphism (differences in male and female) do not exist in the hot carcass and dressed head of rabbit, however the dressing yields were higher in male than female rabbits. Female and male rabbits were similar in the weights of fore legs, hind legs, ribs and loin (Yalcin et al. 2006). Fayeye and Ayorinde (2008) also reported that sex effect was not significant on carcass characteristics such as bled-weight, dress carcass weight, dressing percentage, carcass length, gastrointestinal tract, pelt, external offal, edible offal, adipose fat and primal cuts (shoulder-rib, loin and leg). The findings of Baiomy and Hassanien (2011) showed that the effect of sex was non-significant on mean values of hot carcass, giblet, dressed head and total edible parts of rabbit carcass.

However, Murshed et al (2014) observed that slaughter weight and carcass weights were slightly lower males than in females while the dressing percentage was higher in male than in female rabbit. Similarly Trocino et al. (2002) also reported that females showed higher live weight and lower dressing percentage due to the higher incidence of the gut content.

Excessive temperature and humidity induces physiological stress in rabbits (Marai et al. 2002). Ondruska et al. (2011) reported that total and daily feed intake, feed conversion ratio, and total and daily gain in body weight for growing rabbits were affected negatively by elevated temperature. Fadare (2014) reported that the ability to tolerate heat differs between male and female rabbits in the humid tropical environment characterized with high ambient temperature and relative humidity.

This study was therefore carried out to investigate the carcass characteristics of male and female rabbits raised in a humid tropical environment.

**Materials and Method**

**Experimental site**

The experiment was carried out at the rabbitry unit of the Department of Environmental Biology and Fisheries, Adekunle Ajasin University Akungba-Akoko, Ondo state. Akungba–Akoko is located in Akoko South West Local Government Area of Ondo state, Nigeria. The area lies in the south western region of Nigeria (7° 28’ and 5° 43’ ) and has the following environmental condition: ambient temperature of 27°C and relative humidity of 46mm Hg.

**Experimental animals and management**

Forty eight (48) male and female rabbits were used for this experiment. The experimental animals were kept in a wooden cage with each compartment of dimension of length× width× height: 80× 50 ×30 cm³.
The cages were constructed of wood and a wire mesh. The hutch was constructed in a way that it allow there waste to drop on the floor easily and has a single roof which covers all cages from rain or sunlight. They were fed with commercial pelleted diet; the diet used contained 15% Crude protein, 7% fat, 10% Crude fibre, 1.0% Calcium, together with available phosphorus of 0.35% and 2550Kcal/kg metabolisable energy. They were also supplied with forages. Clean water was also supplied to the rabbits ad- libitum.

**Slaughtering and dissection procedure**

At 12 weeks of age, all the rabbits were weighed and slaughtered. Rabbits were weighed and stunned before slaughter. Each rabbit was bled and weighed to determine the blood weight. The fur was removed and weighed after slaughter. The head was separated and the internal organs were also removed and weighed. The carcass was split between the 7th and 8th thoracic vertebrae and between the 6th and 7th lumbar vertebrae. Carcass parts (fore-, mid- and hind part) were weighed; the hind legs (HL) were removed and weighed. The pelts, tail and other inedible parts were also measured with a sensitive scale.

**Data collection**

Pre-slaughter weight: This was the live weight of each rabbit before slaughter in grams

Hot carcass/ slaughter weight: This was the weight after slaughter and bleeding of rabbit

Giblets (g): Total weight of kidney, liver, lung and heart

Inedible carcass (g): Total weight of pelt, blood, offal, tail and feet.

Edible carcass (g): This included the carcass parts (fore-, mid- and hind part), dressed head and giblet

Dressing yield (%): This was taken as the percentage of edible carcass to the pre-slaughter weight.

**Statistical analysis**

Data obtained from the measurements was analysed using SAS 2007. The linear model is as specified in below:

\[ Y_{ijk} = \mu + A_i + e_{ijk} \]

\( Y_{ijk} \) = the parameter or interval

\( \mu \) = overall mean for the parameter of interest

\( A_i \) = Fixed effect of \( i \)th sex (j=1-2)

\( e_{ijk} \) = random error associated with each record (Normally= Independently and identically distributed with zero mean and variance \((\delta^2e)\)
Results and Discussion

The least square means of the carcass composition presented on Table 1 shows that there was significant difference in the pre-slaughter weight of male and female rabbits. Male rabbits had higher weight (2220.60 ± 71.2g) than their female counterparts (2088.70 ± 11.5 g) at 12 weeks of age. The hot carcass weight of male rabbits was also higher than that of female rabbits. However, the relative percentage of the hot carcass weight to pre-slaughter weight was not significantly affected by sex. However Murshed et al. (2014) reported that slaughter weight and carcass weights were slightly lower in male than female rabbit. Trocino et al. (2002) also reported that female rabbits showed higher live weight but lower dressing percentage due to the higher incidence of the gut content.

Table 1: Least square means of the carcass composition

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-slaughter wt (g)</td>
<td>2088.70± 35.71 b</td>
<td>2220. 50± 44.23 a</td>
</tr>
<tr>
<td>Hot carcass (g)</td>
<td>2023.91 ± 15.59 b</td>
<td>2150. 62 ±14.13 a</td>
</tr>
<tr>
<td>Hot carcass (%)</td>
<td>96.89± 0.41</td>
<td>96.84± 0.59</td>
</tr>
<tr>
<td>Giblets(g)</td>
<td>87.14 ±1.52 a</td>
<td>76.97 ± 0.23 b</td>
</tr>
<tr>
<td>Giblets (%)</td>
<td>4.17± 0.19 a</td>
<td>3.47 ± 0.18 b</td>
</tr>
<tr>
<td>Inedible carcass(g)</td>
<td>867.24± 7.23 b</td>
<td>880.95 ± 5.23 a</td>
</tr>
<tr>
<td>Inedible carcass (%)</td>
<td>41.52 ± 2.65</td>
<td>39.67 ± 3.54</td>
</tr>
<tr>
<td>Edible carcass (g)</td>
<td>1221.46 ±10.29 b</td>
<td>1339.75±12.58 a</td>
</tr>
<tr>
<td>Dressing yield (%)</td>
<td>58 .48± 1.95 b</td>
<td>60.33 ± 1.36 a</td>
</tr>
</tbody>
</table>

a b Mean on the same row with different superscripts are significantly (P<0.05) different.
The percentages of the parameters were taken relative to the pre-slaughter weight of each sex.

Sexual dimorphism was observed in the total giblets weights and the relative percentage of the giblet weight to pre-slaughter weights in favour of the female rabbits. The effect of sex was also significant on the weight of inedible carcass. However, the relative percentages of the inedible carcass weight to pre-slaughter weight were statistically similar between male and female rabbits. Nevertheless the edible carcass weight of male rabbits was significantly higher (1339.75 ±12.58g) than that of female rabbits (1221.46 ±10.29g) which subsequently made the dressing yield of the male rabbits (60.33%) higher than the yield of female rabbits (58.48%). Baiomy and Hassaniel (2011) reported that the dressing yield was higher in male than the female rabbits (59.3 % and 57.5% respectively). According to Murshed et al. 2014, dressing percentages were higher in male than female rabbit.
In the least square means of the primal cut-out parts presented on Table 2 showed that the fore part of male rabbits was significantly higher than that of female rabbits. However, sexual dimorphism was not observed in the weight of thorax parts of the rabbits. Yalçın et al. 2006 observed that female and male rabbits were similar in the weights and percentages of fore legs, hind legs, ribs and loin. However, the effect of sex was significant on the loin weight of rabbits in this study. Female rabbits had heavier loin (309.40±11.50g) than the male rabbits (271.21. ±12.85g). Sexual dimorphism also existed in the hind leg weight of rabbits. Male rabbits had higher hind leg weight than the female (Table 2). The effect of sex was also significant on the weight of the dressed head with the female rabbits having higher values than the male rabbits. However, Murshed et al. (2014) reported that there were no differences between female and male rabbits in the weights and percentages of fore legs, hind legs, thorax and loin. According to Baiomy and Hassanien (2011), sex did not seem to affect the relative weights of different physical primal cut-out parts. Non-significant effect of sex on different physical cuts of rabbit carcass was also observed by Ghosh and Mandal (2008).

Table 2: Least square means of the primal cut-out parts

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fore parts</td>
<td>160.47 ±9.55</td>
<td>170.56 ±7.23</td>
</tr>
<tr>
<td>Thorax</td>
<td>225.28 ± 9.24</td>
<td>228.53 ± 7.73</td>
</tr>
<tr>
<td>Loin</td>
<td>309.40 ± 11.50</td>
<td>271.21 ± 12.85</td>
</tr>
<tr>
<td>Hind leg</td>
<td>380.97 ± 13.10</td>
<td>398.75± 8.04</td>
</tr>
<tr>
<td>Dressed head</td>
<td>125.50± 5.87</td>
<td>116.35±7.69</td>
</tr>
</tbody>
</table>

\(^{a,b}\) Mean on the same row with different superscripts are significantly (P<0.05) different.

The percentages of the parameters were taken relative to the pre-slaughter weight of each sex

The least square means of the internal organs is presented on Table 3. Although, the weight of male rabbit heart was slightly higher than female rabbit, there was no significant difference in the relative percentage of the heart weight to the pre-slaughter weight of male and female rabbit Yalçın et al. 2006 reported that sexual dimorphism do not exist in the liver, lung, heart and kidney weights of rabbits. There was no significant difference in organ weights in male and female rabbits (Baiomy and Hassanien, 2011).

The kidneys of both sexes were also similar in weights and in relative percentages in this study. The same trend was observed with the lung of the rabbits (Table 3). However the liver weight of the female rabbit was higher than the male rabbits. Sexual dimorphism was not observed in the weight of the gastrointestinal tract as well as their relative percentage to the pre-slaughter weights. Farghaly and El-Mahdy
(1999) also recorded non-significant effect of sex on different organ weights except liver weight which was significantly higher in females than males. There was no significant difference between heart and kidney weight of male and female rabbits (Murshed et al., 2014). Ghosh and Mandal (2008) also reported that the effect of sex was not significant on the weights of liver, heart and kidney of rabbits.

### Table 3: Least square means of the internal organs

<table>
<thead>
<tr>
<th>Parameters (g)</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart(g) (%)</td>
<td>4.49 ± 0.24&lt;sup&gt;b&lt;/sup&gt;</td>
<td>5.10 ± 0.05&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Kidney(g) (%)</td>
<td>10.51 ± 0.74</td>
<td>10.83 ± 0.31</td>
</tr>
<tr>
<td>Lung (g) (%)</td>
<td>9.73 ±0.94</td>
<td>9.65 ± 0.45</td>
</tr>
<tr>
<td>Liver (g) (%)</td>
<td>61.80 ± 4.49&lt;sup&gt;a&lt;/sup&gt;</td>
<td>53.00 ± 2.53&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>GIT (g) (%)</td>
<td>490.56 ± 10.30</td>
<td>470.23 ± 20.25</td>
</tr>
</tbody>
</table>

<sup>a,b</sup> Mean on the same row with different superscripts are significantly (P<0.05) different.

The percentages of the parameters were taken relative to the pre-slaughter weight of each breed

GIT - Gastro intestinal tract

In the inedible part of the rabbits is presented on Table 4, blood weight of male rabbit was slightly higher than female rabbit, however, the relative percentages to pre-slaughter weight were similar in both sexes. Male and female rabbits also had similar fur weight. The effect of sex was also not significant on the weight of the offals. However female rabbits had lower feet weight than the male rabbits. Sexual dimorphism does not exist in the tail weight as well as their relative percentage to the pre-slaughter weights of the rabbits. According to Baiomy and Hassanien (2011), there was no significant difference between the sexes in the inedible parts of rabbit carcass.

### Table 4: Least square means of the inedible parts

<table>
<thead>
<tr>
<th>Parameters (g)</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood (g) (%)</td>
<td>65.14 ± 2.38&lt;sup&gt;b&lt;/sup&gt;</td>
<td>70.28 ± 1.65&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Pelt weight (g) (%)</td>
<td>135.62 ± 8.65&lt;sup&gt;b&lt;/sup&gt;</td>
<td>140.26 ± 4.52&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Offal (g) (%)</td>
<td>647.81 ± 16.42</td>
<td>649.25 ± 11.35</td>
</tr>
</tbody>
</table>

<sup>a,b</sup> DOI 10.5455/ijlr.20150313052755
Feet (g)  
16.15 ± 0.77^b  
18.45 ± 0.34^a  
(%)  
0.77 ± 0.14  
0.83 ± 0.09  
Tail (g)  
2.53 ± 0.41  
2.61 ± 0.52  
(%)  
0.12 ± 0.01  
0.11 ± 0.02  

^a,b Mean on the same row with different superscripts are significantly (P<0.05) different.

The percentages of the parameters were taken relative to the pre-slaughter weight of each breed.

Conclusion

Male rabbits had higher hot carcass weight than female rabbits. The edible carcass weight of male rabbits was higher than female rabbits which subsequently made the dressing yield of the male rabbits higher than the yield of female rabbits. Male rabbits also had higher weight of fore part and hind leg. There was no significant difference in the relative percentage of the organ weights to the pre-slaughter weights of male and female rabbits.

References