

Effect of Coat Colour and Sex on Carcass Characteristics of Local Rabbits in Northern Region of Ghana

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Abstract

This study was conducted to assess the effect of coat colour and sex on carcass characteristics of local rabbits in the northern region of Ghana. Data were collected on 24 rabbits (12 males and 12 females) from six colour varieties. Animals were slaughtered according to standard abattoir procedure and parameters recorded were live weight, bled weight, skinned weight, hot carcass dressing weight, lung weight, heart weight, liver weight, kidney weight, empty intestine weight and cold carcass dressing weight. Carcass data were analyzed using GLM of SPSS to investigate the effect of colour variety and sex on carcass measurements. The effect of colour variety was not significant ($p>0.05$) for all parameters measured. Sex was a highly significant ($p<0.01$) source of variation for hot carcass dressing percentage and empty intestine weight. The males had higher ($p<0.01$) hot carcass dressing percentage (50.57%) than the females (47.43%), and higher ($p<0.05$) cold carcass dressing percentage (47.04%) than the females (44.56%). However, the females had significantly ($p<0.05$) heavier liver weight ($47.13\pm 2.4g$) and significantly ($p<0.01$) heavier empty intestine weight ($104.03\pm 5.7g$) than the respective values of $40.12\pm 2.3g$ and $82.78\pm 2.5g$ for the males. Conclusively, coat colour of rabbits showed no substantial differences in all carcass characteristics while males had higher carcass dressing percentage (both hot carcass and cold carcass) than the females.

Keywords: Dressing percentage, meat, slaughter, weight

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INTRODUCTION

Rabbit is one of the cheapest sources of meat in West African countries, which has been neglected to some extent. Rabbit meat is classified as white meat, with low cholesterol level and nutrient elements absorption at 90%. It is also classified as functional foods [1, 2]. Rabbit meat is also relished by health conscious consumers, the elderly and the people living with debilitating disease conditions due to its low fat and cholesterol contents [3].

Meat yield from rabbit may be influenced by a number of factors. It is stated that the weight lost between live weight and carcass weight is known as the dressing loss, and is usually given as a percentage (the dressing-out percentage) [4]. This is the carcass weight as a percentage of the live weight. For mature rabbits the dressing-out percentage is about

60%, and for younger rabbits, it may reduce to 50% or even less [4]. Dressing-out percentage is generally in the range of 50–60% [5, 6]. Differences in the live weight and dressing yield of rabbits have been attributed to sex, slaughter age, weaning age and feeding conditions [7–11]. Also, carcass traits were influenced by the adult weight and the maturity of rabbits at the age of slaughter [12, 13]. The sex and colour of animals are among the important characters considered when taking decisions about individual animals especially on breeding and marketing. In small ruminants like sheep, white coloured males are most preferred by consumers during Islamic festivities. The coat colour of animals plays a role in managing heat stress since different colours reflect or absorb light rays differently. It is however, not known whether the colour and the sex of the rabbit influence the carcass output or not. This study was therefore,

conducted to assess the effect of sex and coat colour on carcass characteristics of local rabbits in the northern region of Ghana.

MATERIALS AND METHODS

Location of Study

The study was conducted at the Meat Unit of the University for Development Studies, Nyankpala campus. Nyankpala is located on latitude 9°25'41"N and longitude 0°58'42"W at altitude 183 m above sea level [14]. The area has unimodal rainfall pattern which begins in April rising to a peak in August–September and ending in October or November with an average of 1060 mm. Temperature ranges from 15°C in January when the weather is under the influence of the North East (Harmattan) winds to 42°C around the end of the dry season in March [14].

Management of Study Animals and Sampling

The rabbits were housed and fed by the farmers until the time of purchase. Rabbits were housed in locally constructed structures made of mud or wooden walls with the roof being thatch or iron sheets. The floors of the houses were made of concrete or sand. Holes were created in the sand by the rabbits and used as nests and hiding places. Pots, old lorry tyres, or empty galons/cans were put in concrete floor houses to serve the same purpose.

The rabbits were fed similar feed comprising of kitchen waste, grasses and a wide range of byproducts including pito mash, corn chaff, groundnut leaves, acacia leaves, bean vines, sweet potato leaves, fig leaves, cassava and yam peels, plantain peels and grasses. Feed and water were provided in troughs and administered *ad libitum*.

Purposive sampling was used to locate rabbit farmers. Twenty-four rabbits (12 males and 12 females) comprising of six colour varieties (white = four, brown = four, red = four, black = four, black and white = four and brown and white = four) were acquired from Northern region and used for carcass evaluation. Through negotiations, a large number of the animals needed were bought. Then the animals bought were grouped into clusters based on coat colour. In each cluster, animals were

stratified using sex as strata. Simple random sampling was then used to draw animals from each strata. Age range of rabbits was 11–13 months as estimated by the farmers. The animals were housed in cages with concrete floors and fed with well-formulated finisher diet for 3 days before slaughter. Feed was withdrawn 24 h prior to slaughter.

Data Collection

Slaughter of rabbits was done according to standard abattoir procedure [15]. Measurements of the following carcass traits were recorded:

- *Live weight*: The final weight of the live rabbit.
- *Bled weight*: The weight of the slaughtered rabbit after bleeding for 15 min.
- *Skinned weight*: The weight of the bled carcass after the skin has been removed.
- *Dressed weight*: The weight of the rabbit after the removal of viscera, shanks, and the head.
- *Cold carcass dress weight*: The weight of the chilled dressed carcass (carcass was chilled for 24 h at a temperature of 20°C).
- *Viscera Weight*: the weight of all internal organs.
- *Meat and bone percentages*: This involved removing the flesh from bones and measuring the weights to calculate percentage of meat and bone in the total carcass.

Statistical Analyses

Carcass data were analyzed using the GLM procedure to investigate the effect of colour variety and sex on carcass measurements [16]. Means were separated using LSD at 5% level of significance under the Post Hoc Multiple Comparison. The model used was:

$$Y_{ij} = \mu + V_i + S_j + VS_{ij} + \varepsilon_{ij}$$

Y_{ij} = carcass traits of the i^{th} colour and j^{th} sex; μ = the overall mean; V_i = the effect of the i^{th} colour variety of rabbit; S_j = the effect of the j^{th} sex, j = male, female; VS_{ij} = is the interaction effect between i^{th} colour variety and the j^{th} sex; ε_{ij} = the random error term, $\varepsilon_{ij} \sim N(0, \sigma^2)$.

RESULTS

Carcass Characteristics of Rabbits

The results revealed that the indigenous rabbits

lost about 3% of their live body weight after bleeding. The edible internal organs (lung, heart, liver and kidneys) constituted 4.92% of the live body weight of the rabbit (Table 1).

Colour varieties had no notable effect ($p > 0.05$) on all carcass characteristics (Table 2). Whereas black coloured rabbits recorded

numerically highest deboned carcass weight, black and white rabbits recorded numerically highest kidney and empty intestine weights.

The sex of rabbits was found to be a highly significant ($p < 0.01$) source of variation for hot carcass dressing percentage and (empty) intestine weight (Table 3).

Table 1: Carcass Characteristics Expressed as a Percentage of Live Weight.

| Carcass characteristics | Actual weight | Percentage of live weight |
|----------------------------|---------------|---------------------------|
| Bled weight (kg) | 1.28 | 97.0 |
| Dressed weight (hot) (kg) | 0.65 | 48.99 |
| Dressed weight (cold) (kg) | 0.61 | 45.80 |
| Skinned weight (kg) | 1.15 | 87.4 |
| Lung weight (g) | 8.45 | 0.64 |
| Heart weight (g) | 3.43 | 0.26 |
| Liver weight (g) | 43.56 | 3.30 |
| Kidney weight (g) | 9.50 | 0.72 |

Table 2: Effect of Colour Variety on Carcass Characteristics of Rabbits.

| Parameter | Overall Mean | White | Brown | Red | Black | Black/white | Brown/white | P-value |
|-----------|--------------|--------------|-------------|--------------|--------------|--------------|--------------|---------|
| LW (kg) | 1.32±0.04 | 1.23±0.20 | 1.33±0.03 | 1.34±0.10 | 1.34±0.10 | 1.35±0.10 | 1.35±0.10 | 0.94 |
| BLW (kg) | 1.28±0.04 | 1.19±0.20 | 1.29±0.03 | 1.30±0.10 | 1.30±0.80 | 1.31±0.20 | 1.32±0.10 | 0.93 |
| SW (kg) | 1.16±0.03 | 1.07±0.11 | 1.18±0.02 | 1.19±0.1 | 1.15±0.1 | 1.17±0.1 | 1.19±0.1 | 0.89 |
| HCDW (kg) | 0.65±0.02 | 0.60±0.11 | 0.65±0.01 | 0.67±0.04 | 0.67±0.10 | 0.66±0.10 | 0.65±0.02 | 0.93 |
| HCD (%) | 48.99±0.51 | 48.65±0.90 | 48.71±0.80 | 49.74±1.01 | 49.79±1.22 | 48.76±1.52 | 48.36±2.00 | 0.95 |
| CCDW (kg) | 0.61±0.02 | 0.55±0.11 | 0.62±0.01 | 0.63±0.04 | 0.63±0.11 | 0.61±0.11 | 0.62±0.02 | 0.89 |
| CCD (%) | 45.80±0.51 | 44.38±1.01 | 46.09±0.40 | 46.71±1.12 | 46.45±1.12 | 45.34±1.12 | 45.84±2.6 | 0.86 |
| DCW (g) | 334.24±10.62 | 290.20±43.31 | 353.92±9.51 | 328.42±16.44 | 368.53±30.23 | 306.33±12.34 | 357.53±14.23 | 0.20 |
| BW (g) | 266.80±10.62 | 249.92±25.22 | 256.31±9.31 | 296.54±25.04 | 251.50±22.43 | 299.91±48.01 | 246.81±7.64 | 0.53 |
| LW (g) | 8.41±0.43 | 8.71±1.13 | 8.22±0.24 | 8.92±0.43 | 7.83±1.64 | 8.73±1.71 | 8.11±0.43 | 0.97 |
| HW (g) | 3.42±0.20 | 3.43±0.44 | 3.43±0.42 | 3.34±0.51 | 3.72±0.24 | 3.82±0.22 | 3.43±0.64 | 0.97 |
| LVW (g) | 43.62±1.82 | 43.82±5.41 | 43.51±3.22 | 41.31±2.53 | 41.11±8.02 | 46.82±2.54 | 45.42±4.83 | 0.95 |
| KW (g) | 9.54±0.34 | 8.80±0.92 | 8.82±0.43 | 9.74±0.22 | 9.84±0.52 | 10.61±1.40 | 9.22±0.40 | 0.54 |
| EIW (g) | 93.41±3.84 | 85.11±11.63 | 88.51±3.91 | 98.73±8.72 | 87.82±6.92 | 103.11±15.14 | 97.41±8.03 | 0.73 |

P-value = probability value, kg = kilograms, g = grams and % = per cent

LW = live weight, BLW = Bled weight, SW = Skinned weight, HCDW = Hot carcass dress weight, HCD% = Hot carcass dressing per cent, CCDW = Cold carcass dressing weight, CCD% = Cold carcass dressing per cent, DCW = Deboned carcass weight, BW = Bones weight, LW = Lung weight, HW = Heart weight, LVW = Liver weight, KW = Kidney weight and EIW = Empty intestine weight.

Table 3: Effect of Sex on Carcass Characteristics of Rabbits.

| Parameter | Overall Mean | Male | Female | P-value |
|-----------------------------------|--------------|---------------|------------------|---------|
| Live weight (kg) | 1.32 ± 0.04 | 1.290 ± 0.041 | 1.355 ± 0.056 | 0.362 |
| Bled weight (kg) | 1.28 ± 0.04 | 1.253 ± 0.041 | 1.313 ± 0.056 | 0.399 |
| Skinned weight (kg) | 1.16 ± 0.03 | 1.117 ± 0.036 | 1.193 ± 0.050 | 0.225 |
| Hot carcass dress weight (kg) | 0.65 ± 0.02 | 0.653 ± 0.025 | 0.643 ± 0.019 | 0.795 |
| Hot carcass dressing (%) | 49.00±0.49 | 50.57±0.491 | 47.431±0.556 | <0.001 |
| Cold carcass dressing weight (kg) | 0.61 ± 0.02 | 0.61 ± 0.02 | 0.605 ± 0.029 | 0.931 |
| Cold carcass dressing (%) | 45.8±0.53 | 47.04±0.64 | 44.562±0.677 | 0.014 |
| Deboned carcass weight (g) | 334.2 ± 10.6 | 343.1 ± 15.4 | 326.183 ± 14.70 | 0.462 |
| Bones weight (g) | 266.8±10.6 | 264.9 ± 12.0 | 268.714 ± 18.131 | 0.864 |
| Lung weight (g) | 8.42 ± 0.40 | 8.10 ± 0.53 | 8.730 ± 0.610 | 0.444 |
| Heart weight (g) | 3.41 ± 0.15 | 3.26 ± 0.17 | 3.563 ± 0.238 | 0.308 |
| Liver weight (g) | 43.6 ± 1.79 | 40.1 ± 2.29 | 47.130 ± 2.418 | 0.047 |
| Kidney weight (g) | 9.45 ± 0.31 | 9.17 ± 0.27 | 9.714 ± 0.546 | 0.398 |
| Empty intestine weight (g) | 93.4 ± 3.77 | 82.8 ± 2.55 | 104.032 ± 5.690 | 0.003 |

P-value = probability value, kg = kilograms, g = grams and % = percent

The males had higher ($p < 0.01$) hot carcass dressing percentage than the females, and higher ($p < 0.05$) cold carcass dressing percentage than the females. About 3.19% carcass weight was lost to freezing. However, the females recorded significantly ($p < 0.05$) higher liver weight and highly significantly ($p < 0.01$) higher empty intestine weight than the male counterparts. All other carcass traits were not significantly influenced ($p > 0.05$) by sex (Table 3).

DISCUSSION

An important carcass characteristic for commercial rabbit production is the dressing percentage. The loss of about 3% of its live body weight after bleeding in this local rabbits was similar to the result in guineafowl, but differs widely from other earlier work which reported that guinea fowls in northern Ghana lost 8% of the live weight after bleeding [17,18]. The hot carcass dressing-out percentage in this study was lower than the range of 50–60% reported in earlier studies [4, 5]. A higher value of $59.7 \pm 8.1\%$ was reported about a decade ago, while the value of 54.05% was recently reported for local rabbits on control diet [6,19]. The low dressing-out percentage in the present study may be due to poor nutrition because farmers use only local management systems. Balancing of diets of animals in this system is rare. It has been stated that an animal which has been reared on a low level of nutrition will have a lower dressing-out percentage than one reared on a high level of nutrition. It could also be due to the small size of indigenous rabbits [4]. The cold carcass dressing percentage of 53.1% reported for local rabbit on control diet was higher than the 45.80 recorded in this study [6]. The difference between hot carcass dressing percentage and the cold carcass dressing percentage was due to moisture losses as a result of freezing. The rabbits in the present study recorded higher values for lung weight, heart weight, liver weight, kidney weight and empty intestine weight than the figures reported in earlier studies for the same internal organs except kidney weight [6]. These differences in carcass traits between this study and other studies might be due to breed differences, animal age, gut content, management practices or more so, variation in measurements between the researchers.

The similarities in carcass characteristics including dressed weight, among all colour varieties suggest that colour has no influence on the growth and development of the local rabbit under study. This is different from findings in poultry, which indicated significant effect of colour variety on carcass characteristics of local guinea fowls in northern Ghana [17]. The significant effect of sex on certain carcass characteristics suggests the existence of sexual dimorphism [20, 21]. The difference may be due to the higher incidence of the gut content [8, 9]. It might also be due to the slaughter age, breeding, weaning age and feeding conditions [10, 11]. Slaughter weight, bled and skinned weights were slightly lower while dressing percentages being higher in males than in females was in contrast to earlier research findings. According to the results of other researchers, dressing yield was lower for males than for females [7]. Researchers found sex to be a significant source of variation for carcass traits [22]. Based on the present findings, consumers and all rabbit meat users are advised to always look for male rabbits for slaughter since they have high meat output (dressing yield). Likewise, farmers, policy makers and rabbit sellers should consider sex when pricing their rabbits.

CONCLUSION

The colour of rabbits had no effect on all carcass characteristics. The males had highly significant carcass (both hot and cold) dressing percentage than the females. However, the females recorded significantly higher liver weight and empty intestine weight than their male counterparts. All other carcass parameters were not influenced by sex. Sexual dimorphism should be useful factor to consider in pricing of rabbits.

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