Study on live weight, carcass weight and dressing percentage of Issa camels in Ethiopia

W. ABEBE*, A.M. GETINET and H.M. MEKONNEN

Addis Ababa University, Faculty of Veterinary Medicine, Department of Pathology and Parasitology, Postal code 34, Debre Zeit, Ethiopia
Ministry of Agriculture, Department of Veterinary Services, Zone 3, Ethiopia

* Author to whom all correspondence should be made.
Fax : +251-1-339933 ; Tel. 338062, 338557 ; P.O. Box : 34 ; Ext. 232 ; E-mail : vet.medicine@telecom.net.et ; wosseneabebe@hotmail.com

SUMMARY

An attempt was made to determine the live weight, carcass weight and dressing percentage of Issa camels of various age groups raised under natural field condition. The mean live weights estimated from Barymetric measurements (shoulder height, thoracic and abdominal girth) were 131.9 ± 20.3 kg (for calves less than 1 year of age), 211.6 ± 20.2 kg (1-3 years of age), 294.6 ± 13.3 kg (3-6 years of age), 355 ± 25 kg (6-10 years of age) and 425.9 ± 6.9 kg (older than 10 years of age). A strong positive correlation was obtained between live weight estimates and barymetric measurements, the superior being with thoracic girth (r = 0.96). Issa camels slaughtered at Dire Dawa slaughterhouse had an average carcass weight of 233.4 kg and dressing percentage of 52.7%. Positive correlation effect was confirmed between live weight and dressing percentage (r = 0.77) and between carcass weight and dressing percentage (r = 0.47). While a negative relationship was found between live weight and dressing percentage (r = -0.2). Forequarters followed by the hindquarters constitute the highest proportion of the carcass in relation to the live body weight and whole carcass weight.

KEY-WORDS : barymetry - live weight - carcass weight - dressing percentage - Issa camel - Ethiopia.

RÉSUMÉ

Étude sur les poids vifs, poids des carcasses et le rendement à l’abattage des chameaux d’Issa en Ethiopie. Par W. ABEBE, A.M. GETINET et H.M. MEKONNEN.

Une étude a été menée afin d’évaluer le poids vif, le poids en carcasse et le rendement à l’abattage des chameaux d’Issa élevés dans les conditions naturelles. Les poids vifs moyens estimés par la mesure barymétrique (hauteur de l’épaule, circonférences de la cage thoracique et abdominale) étaient 131.9 ± 20.3 kg (pour les chameaux de moins d’un an), 211.6 ± 20.2 kg (entre 1 et 3 ans), 294.6 ± 13.3 kg (entre 3 et 6 ans), 355 ± 25 kg (entre 6 et 10 ans) et 425.9 ± 6.9 kg (chameaux de plus de 10 ans d’âge). Une corrélation positive a été obtenue entre la valeur du poids vif et la mesure barymétrique, la plus forte corrélation était avec la circonférence de la cage thoracique (r = 0.96). Le poids moyen de la carcasse et le rendement à l’abattage des chameaux d’Issa abattus dans l’abattoir de Dire Dawa étaient 233.5 kg et 52.5% respectivement. Une corrélation positive a été obtenue entre le poids vif et le rendement à l’abattage (r = 0.77) ainsi que entre le poids en carcasse et le rendement à l’abattage (r = 0.47). Alors qu’elle est négative entre le poids vif et le rendement à l’abattage (-0.2). Le poids du quartier avant suivi par le poids du quartier arrière représente une plus grande proportion dans la mesure du poids vif et du poids carcasse.


Introduction

The one humped Camelus dromedarius has a special position in the life of many nomadic people of African countries, as it is the main supplier of meat, milk and draft power [1, 18]. The love, affection and admiration that the nomadic peoples have for the camel are very deep [6]. Despite its significant contribution to the livelihood of pastoral society who does not have any alternative mode of production system, the camel is one of the neglected domestic livestock in Ethiopia [2]. Very few attempts have been made so far to characterize the production potential and related parameters of camels raised under natural condition. Measurable indices related to body weight are important for proper dosing of drugs and to a lesser extent in the modern animal husbandry for culling, slaughtering and assessing feed conversion performances [21]. Others like carcass weight and dressing percentage are also important indicators of meat production potential of animals. The available information on productivity of this animal is mostly limited to milk production indices and reproductive parameters. The present study is therefore aimed at gathering data on live body weight, carcass weight and dressing percentage of Issa type camels raised under natural condition. As part of meat production indices of Issa camels, the effect of age and sex on live body weight and the relationship between carcass weights and live body weights are assessed.
Material and methods

LIVE BODY WEIGHT DETERMINATION

The study was carried out on 200 Issa type camels selected randomly and raised under natural conditions. All the animals were apparently healthy. Observations and measurements recorded for all study animals included sex, age, and live body weight. The age was determined based on dentition pattern according to Payne [14] and this was further substantiated by the breeders themselves. The body weight estimation was done using Barymetric weight estimation formula [1, 11, 21] as follows: Weight (kg) = 52 x S (m) x T (m) x A (m) ± 25 kg, where S stands for shoulder height, T for thoracic girth and A for abdominal girth in meter. For the purpose of determination of average body weight for different developmental stages, data on live body weight were grouped into 5 age range classes. Camels below 1 year were considered as calves (group 1), 1-3 years as young (group 2), 3-6 years as animals at puberty age (group 3), 6-10 years as fully grown adults (group 4), and older than 10 years as mature adults (group 5).

CARCASS WEIGHT AND DRESSING PERCENTAGE

108 camels slaughtered at Dire Dawa local slaughterhouse were used for the above study. The animals were deprived of water and feed for at least 12 hours. The live weights of the animals were determined using the Barymetric weight estimation formula while the carcass weight and weights of whole sale cuts were measured using a weighing balance. Dressing percentage (D %) was calculated from the estimated live and carcass weight as follows:

\[
D \% = \frac{\text{Carcass Weight}}{\text{Live body weight (kg)}} \times 100
\]

ANALYSIS OF RESULTS

Microsoft excels, a computer software program was used to store database and carry out preliminary statistical analysis. Using «Stat view», statistical software, analysis of variance and correlation effects were tested as appropriate.

Results

LIVE BODY WEIGHT

The estimated live body weight of camels according to their age groups is presented in Table I. The mean weight differences in different age groups were significant (p < 0.05). Within groups, the barymetric measurements and weights were greater for males than for females. A strong positive correlation was found among barymetric measurements with a correlation coefficient of r = 0.92 (T and S), r = 0.93 (A and T) and r = 0.86 (A and S). The live body weight (Wt) is strongly and positively correlated to each barymetric measurements. The maximum correlation coefficient found was with thoracic girth (r = 0.96).

CARCASS WEIGHT AND DRESSING PERCENT

The carcass weight and dressing percentage of camels slaughtered at Dire Dawa municipal abattoir are shown in Table II. All the animals involved in carcass weight and dressing percentage determination were aged over 10 years as determined from their dentition pattern. The overall mean carcass weight and dressing percentage obtained were 233.4 kg and 52.8 % respectively. Variation due to sex was observed for carcass weight and dressing percentage, males being superior in both parameters with a significant mean differences (P < 0.05). Analysis of correlation effect showed a strong positive relationship (r = 0.77) between live body weight and carcass weight followed by dressing percentage and carcass weight (r = 0.47). However, live body weight and dressing percentage were negatively correlated (r = -0.2).

Table III shows carcass weight and dressing percentage of Issa camels on the basis of live weight groups. Animals under the group of 320 to 400 kg weight range have a relatively higher mean dressing percentage than animals grouped under higher live body weight range.

Among the various carcass parts, forequarters followed by hindquarters constitute the highest percentage of proportions in relation to the live weight and whole carcass weight (Table IV). The least proportion is accounted for pectoral and ventral abdominal muscles.

Discussion

Estimation of weight in live state is essential to determine stocking rate, calculate feed requirement, and to properly determine the dose of many veterinary drugs required for administration [21]. The relatively large size of camel and the absence of weighing balance in most camel rearing areas require an alternative measurement techniques and general estimates of weights in different age groups. The estimated live body weight obtained for Issa camels (Table I) using the indirect method (barymetric weight determination formula) can, therefore, serve as a guide for estimation of live weight of different age groups in the absence of weighing instruments.

The mean live body weight of mature Issa camels (425.9 ± 6.9 kg) closely match with the mean live body weight of camels in Northern Kenya [8], Darfur and Kebabish camels of Sudan [12, 20], Areho camels of Eritrea [11] and Afar camels of Awash valley in Ethiopia [10]. However, relatively higher figures of mean live weight for mature camels were reported for Bikanerie, Kutchi, and Jaisahmeri camels in India [22], Ogaden and Borona camels in Ethiopia [1, 19], and for Qatar camels of the Arabian peninsula [21]. These variations might arise from several factors such as age, sex, type/breed of camels used in each study as well as on the general management and ecology of the area. The estimated live weight for mature Issa camels is comparable to that of baggage type camels [16] that are considered to be generally heavier than racing camels. Age and body weight were strongly correlated (r = 0.84) with a significance mean differences among different age groups (p < 0.05). The mean live weight of suckling calves of Issa camels (131.9 ± 20.3 kg) closely matches with previous figures given for Ogaden [1] and Borana [19] camels of Ethiopia. Shoulder height, thoracic and abdominal girths had a strong positive relationship with each other and also with live body weight, supporting the earlier findings of Field [7]. Among the three barymetric measurements, thoracic girth has a superior correlation with live body weight (r = 0.96). It is, therefore, possible to infer that the application of linear regression using thoracic girth measurements for indirect estimation of live body weight seems

STUDY ON LIVE WEIGHT, CARCASS WEIGHT AND DRESSING PERCENTAGE OF ISSA CAMELS IN ETHIOPIA

Note: sd : standard deviation

\[ P < 0.05 \]: age effect on live body weight

Table I. — Estimated live body weights (mean ± sd) of Issa camels determined from shoulder height, thoracic and abdominal girth measurements using Barymetric weight determination formula.

<table>
<thead>
<tr>
<th>Age group</th>
<th>Shoulder Height(m)</th>
<th>Thoracic girth(m)</th>
<th>Abdominal girth(m)</th>
<th>Estimated live weight(kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1 year</td>
<td>1.33 ± 0.09</td>
<td>1.28 ± 0.15</td>
<td>1.4 ± 0.21</td>
<td>131.9 ± 20.3</td>
</tr>
<tr>
<td>1-3 year</td>
<td>1.49 ± 0.18</td>
<td>1.53 ± 0.14</td>
<td>1.74 ± 0.2</td>
<td>211.6 ± 20.2</td>
</tr>
<tr>
<td>3-6 year</td>
<td>1.68 ± 0.1</td>
<td>1.75 ± 0.09</td>
<td>1.91 ± 0.18</td>
<td>294.6 ± 13.3</td>
</tr>
<tr>
<td>6-10 year</td>
<td>1.73 ± 0.15</td>
<td>1.86 ± 0.16</td>
<td>2.1 ± 0.18</td>
<td>355 ± 25</td>
</tr>
<tr>
<td>&gt; 10 year</td>
<td>1.89 ± 0.1</td>
<td>1.97 ± 0.1</td>
<td>2.2 ± 0.18</td>
<td>425.9 ± 6.9</td>
</tr>
</tbody>
</table>

\[ P < 0.05 \]: Sex effect on carcass weight and dressing %

Table II. — Carcass weight and dressing percentage of Issa camels slaughtered at Dire Dawa municipal abattoir.

<table>
<thead>
<tr>
<th>Weight(kg)</th>
<th>Sex</th>
<th>Range</th>
<th>Mean ± sd</th>
<th>Range</th>
<th>Mean ± sd</th>
</tr>
</thead>
<tbody>
<tr>
<td>320 – 400</td>
<td>Female (n=18)</td>
<td>149 - 240</td>
<td>194.5 ± 23.9</td>
<td>39.9 - 66</td>
<td>52.8 ± 5.73</td>
</tr>
<tr>
<td>401 – 480</td>
<td>Female (n=18)</td>
<td>171 - 294.5</td>
<td>235.8 ± 30.4</td>
<td>40.1 - 66.5</td>
<td>53.9 ± 6.69</td>
</tr>
<tr>
<td>481 – 560</td>
<td>Female (n=18)</td>
<td>210.5 - 312</td>
<td>264.4 ± 19.9</td>
<td>41.3 - 59.5</td>
<td>51.5 ± 4.44</td>
</tr>
<tr>
<td>561 – 740</td>
<td>Female (n=18)</td>
<td>272.5 - 327</td>
<td>300 ± 19.85</td>
<td>44.2 - 53</td>
<td>48.5 ± 3.68</td>
</tr>
</tbody>
</table>

Table III. — Carcass weight and dressing percentage of Issa type camels categorized on the basis of live weight.

Table IV. — Percentage proportion (mean ± sd) of different carcass parts to live and carcass weight of male (n = 90) and female (n = 18) Issa camels.

Note: asso. : associated, mus. : muscle, vent. : ventral, abd. : abdomen

* : include muscles on scapula, humerus, radius and ulna

** : include muscles on pelvic girdle, femur, tibia and fibula
to be reliable and easy as it is also described in WILSON [21].

The mean carcass weight of Issa camels (233.4 kg) is far lower than the figures reported for Iranian camel (350-400 kg, Khatami [9]) and Qatar camel (300 kg, Faulkner [5]). The least figure noted was for Darfur camel (208.5 kg) in Sudan [20]. These variations among camels of different geographical origin are indications of direct and indirect effects associated to husbandry practices, nutrition, age, sex, camel type etc. Though the number of female animals examined is lower than males, the mean carcass weight of males is significantly higher than for females (P < 0.05). Similar observations were made on cattle [14]. As observed in other domesticated ruminants [15], the live body weight of Issa camels increases in unison with the carcass weight (r = 0.77).

The weights of the different carcass parts (Table IV) were generally higher in males than females; however, no significant effect (P > 0.05) was observed for hump, hindquarters and rib plus associated inter-costal muscles. The massive muscles in males are apparently distributed to the areas of shoulder, back and sternum. Forequarters followed by hindquarters constitute the highest proportion of the carcass, 31 % and 27 % respectively in both sexes, and least percentage was accounted for hump. The mean dressing percentage of Issa camels was 52.8 % and fall within the range of 40-66.5 % (Table II). This finding closely agrees with the figures reported by Wilson [20], Congiu [3], MORTON [13], and DINA, et al. [4] for one humped camel. Sex was shown to have a significant influence over dressing percentage (P < 0.05); males were having higher dressing percentage than females, 53.7 % and 48.3 % respectively. Similar findings were reported for Darfur camels [20]. Contrary to camels, female cattle had higher dressing percentage than males [15]. The dressing percentage of dromedary is generally superior to most other domestic animals or even, in comparison with game animals [17, 21]. Unlike that of cattle [15], the relationship between dressing percentage and live body weight of Issa camels is slightly negative (r = -0.2). Such difference with cattle is probably attributed to the high gut weight observed in most heavy camels. Though the rumen contents of most camels are equivalent to 11-15 % of body weight, levels up to 20 % of the body weight were recorded in some camels [20]. Furthermore, a camel by virtue of its nature can drink water up to one third of its body weight in 3 minutes [23] which is by far higher than that of cattle. Though not strong, carcass weight and dressing percentage are positively correlated (r = 0.47), an indication of the influence of live weight on both parameters. From the results of dressing percentage according to live weight range (Table III), it can clearly be noted that increased live body weight does not necessarily mean that there is increased dressing percentage. Maximum dressing percentage was noted in animals with less live weight and decreased as the live weight of the animal increased.

The present finding obtained on the live weight, carcass weight and dressing percentage of Issa camels can serve as a guide for any studies related to productivity of this animal and in proper dose calculations of many therapeutic drugs used in treating diseases of camels under field conditions.

Acknowledgements

The authors are grateful to the Ethiopian Agricultural Research Organization for financial support and to Dr. Yilma JOBRE for his valuable support in undertaking this study. We are also grateful to Dr. Getahun DEMEKE, Head of the Dire Dawa Zonal Veterinary Laboratory, for providing all the necessary assistance during the study.

References