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An Evaluation of Live Weight, Carcass and Hide Characteristics in Dromedary *vs*. Bactrian×Dromedary Crossbred Camels

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ABSTRACT

The aim followed in the present paper was to evaluate the slaughter body and carcass weights as well as the characteristics of hide and leather in Dromedaries (one-hump) and in the crossbred *(C. bactrianus×C. droedarius)* camels. Fourteen camels from each sex (female and male) representing two genotypes at 21 months of age were utilized. Slaughter weight, hot and cold carcass weights, dressing-out percentage, wet and dry salting hide and leather properties were assessed. There were significant differences in slaughter weights between Dromedary and crossed types (339±10.7 vs. 372±11.1 kg) and as well between male *vs*. female camels (382±9.7 *vs*. 326±10.6 kg). Moreover, while the effect of sex was significant on wet hide weight (34±1.2 *vs*. 29.3±1.2 kg for males and females, respectively), the difference observed between males and females regarding the thickness of hide was non-significant (P> 0.05). Breaking force, tensile strength and elongation of the leather samples decreased with increase in their thicknesses. It was found out that the obtained leather from the camel benefited from such valuable mechanical characteristics as tensile strength and extension with no variations being observed as due to the animal's sex or genotype.

Keywords: Camel, Carcass weight, Hide characteristics, Leather properties, Slaughter weight.

INTRODUCTION

In Iran, about 41.4% of the pastures are categorized as medium, while 48.2% as poor, unproductive and relatively salty (Khodai, 2001). Therefore, it is difficult to find a suitable domestic grazing species for these regions, where only salty, bland and thorny plants are dominantly grown (Knoess, 1977; Asmare, 2000). However, different technical reports show the ability of camel to adapt to the ecological conditions of dry and semidry regions (Yagil, 1982). In these poor areas, camels can have not only good production rates but also help improve the ecosystem. Due to these potentials, camels play an important socio-economical role in the agriculture and tribal systems of dry and semidry regions of the tropical countries in Asia and Africa (El-Amin, 1979).

The population of camels in Iran is estimated to be about 150,000 heads (FAO, 2010a). This value is almost 0.18% of the total domestic animal population in Iran

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(Kamali *et al*., 2008). The Bactrian camel is one of the indigenous camel breeds of Iran distributed throughout the north-west of the country. Today there are only about 200 Bactrian camels in Ardabil Province and due to its small population, this breed is enlisted as an endangered species (Ansari Renani *et al.,* 2010).

Recently, a scheme of camels' cross breeding has been performed while using the males of Bactrian and the females of Dromedary. The Bactrian crossbred camels have hairy chin and hairy legs, without any hair on the shoulder (Mehta *et al.,* 2004). The Bactrian hump was longer than but not as high as that of the dromedary, and it occasionally showed a small indentation towards the front (Mishra *et al.,* 2000). The crossbred offspring showed heterosis with respect to body size, hardiness, endurance, longevity and milk yield (Lensch, 1991). In addition, fat percentage of the milk was intermediate between those of the parents while wool yield tending towards the higher weights of the Bactrian (Wilson, 1988; Lensch, 1991).

The hide of the camel was considered as one of the heavy types of skin with its leather being mostly utilized in making shoes, sandals, belt, saddle, buckets and vessels for storage of water and milk (Khatami, 1990). According to an official website (Leather com, 2006) in Tunisian camel the area of hides were about 0.9-1.5 m^2 with a thickness of 1.0-2.2 mm. Excellent tensile like kangaroo leather was observed for camel hide with its grain similar to that of goatskins.

The economical value of hide, leather and leather products as well as their by-products are appearing to take higher percentage of the livestock value as compared with the revenue from meat production. FAO (2010b) reported the marketing value of hides and their products around 53,824.8 millions US $ versus 24,105 million US $ of the meat from cattle, sheep and goat during a period between 2003 and 2005.

Few studies have been carried out on skin characteristics, processing and its usage (in domestic species) besides the very few works that have been conducted within the course of studied regarding camel production. Therefore, the objective followed in this study was to evaluate the effect of genotype (pure Dromedary *vs.* Bactrian×Dromedary crossbred) and gender of camel on its hide and leather characteristics, and as well on carcass and body weight.

MATERIALS AND METHODS

Animals and Treatments

Fourteen Iranian Kalkuhi Dromedary (7 males and 7 females) and 14 Bactrian×Dromedary crossbred (7 males and 7 females) camels were allocated into four separate pens. The crossbred camels were the offsprings of male Bactrian and female Dromedaries. One-year old camels were purchased from two commercial flocks from central Iran. The 28 camels were transported to the Animal Science Research Institute of Iran, located in Karaj, where the current study was carried out. After 1-month adaptation, the animals were fattened for a period of 8 months under comparable conditions. The animals were fed *ad libitum* a diet containing 25% alfalfa, 25% wheat straw and 50% concentrate (55% barely, 20% wheat bran, 8% cottonseed meal, 15% sugar beet pulp and 2% salt) as a Total Mixed Ration (TMR).

Live Weight and Carcass Characteristics

The 13 camel were slaughtered at their end of the 21 months of age. The animals were made to fast for 12 hours with free access to water before they were weighed to obtain their slaughter weights. The animals were made to bleed through severing both the carotid arteries and jugular veins on either side and as well the trachea using a sharp knife. No stunning was employed in the

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process. Following the slaughter and complete bleeding, the head and tails were detached. All the abdominal and thoracic organs were removed and weighed. The full weight was subtracted from the slaughter weight to obtain the empty body weight to the nearest grams. The hot carcass weight was recorded immediately after complete dressing. About 20 hours were allowed for the carcass to shrink at 4°C after which the chilled carcass weight was recorded. The removed hides were weighted and allowed to be cured through salting.

Hide and Leather Assessment

Dry salt-curing method was used by rubbing the flesh surface against dry salt. The salted hides were placed in the shade (at 15ºC and 50% humidity for 30 days) to be dried. The extra salt was removed through shaking and the dry salted hides then weighted. The thickness at shoulder, neck, flank and rump of both left and right sides were measured out using a manual thickness gauge. The hides were transferred to tannery house. The hump portion was removed to make the work possible with fleshing machine and as well to carry out the other steps of processing. After separation of the neck portion, the remaining parts were cut and divided into two symmetrical parts. The beam, chrome-tanning and retanning stages comprised of: soaking, unhairing, liming, fleshing, scudding, deliming, degreasing, retanning, splitting, dyeing, oiling, neutralization, dyeing and fat liquoring as well as finishing were conducted to finally shape out the leather.

The leather traits were evaluated employing International Organization for Standardization (2002a, b, c) methods. Accordingly, for a measurement of the tensile strength, the leather samples were cut into two pieces by applying a press knife capable of cutting out a test piece with standard dimension of 110 mm to the grain surface. One test specimen with the longer sides in parallel with the backbone and another with its longer sides perpendicular to the backbone were taken. Vernier calipers were employed to measure width and thickness of each test specimen to the nearest 0.1 mm at areas between the grain side and the flesh side. The arithmetic mean of three measurements was obtained as the width and thickness of the test wherever used. The tensile strength (T_n) was estimated based on kg force per mm^2 using tensile testing machine model 4001 of Instron with cell force of 100 kg. The jaws of this apparatus were set at 50±1 mm apart for using the standard test piece and the clamps being pulled up at the rate of at 100 mm min^{-1}. The greatest force was recorded as the breaking force with the tensile strength (T_n) in kgf mm^{-2} being determined using the following equation:

$$T_n = F/W \times t$$

Where, F is the highest force recorded in kgf, W represents the mean width in accordance with the standard test specimen cut (10 millimeters) and t is the mean thickness of the test piece in millimeters, which would further be converted to kgf cm^{-2}. The percentage elongation at break point was calculated using the following equation:

$$E_b = (L_b - L_0/L_0) \times 100$$

Where, L_b is the extent of separation of the jaws at break and L_0 the initial separation (of the jaws) in millimeters.

Statistical Analysis

The obtained data were statistically analyzed using Generalized Linear Model (GLM) procedure of SAS (2002) software. The model employed was as follows:

$$\gamma_{ijk} = \mu + \alpha_i + \beta_j + (\alpha\beta)_{ij} + \varepsilon_{ijk}$$

Where, γ_{ijk} stands for individual records, μ is the population mean, α_i presents the effect of i sex, β_j is the effect of j genetic group, $(\alpha\beta)_{ij}$ denotes the interaction between sex and genetic group while ε_{ijk} standing for the residual effects.

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The thicknesses of hide and leather taken from different sites of the animal' body were compared using paired *t*-test analyses. A Pearson correlation test employed used to assess the significance of the correlation of the slaughter weight *vs.* cold and hot carcass weights with respect to the wet and dry weights of the skin. The scales of the slaughter and carcass weights as well as the wet and dry weights of the skin differed, therefore, they were transformed to a log scale before the statistical analysis being performed.

RESULTS AND DISCUSSION

Live Weight

The overall means related to the experimental traits are presented in Table 1. There is variation in the estimation of camel live weight in the literature, but it is logical to believe that the weight of camel is dependent on age, sex, nutritional conditions and general health of the animal (El–Amin, 1979). Wilson (1988) reported the estimates of live weight of camels of different countries, with the lightest live weights prevalent in Somalia desert camels (350–400 kg) and the heaviest live-weight (660 kg) in Indian camels. In Australia, the weights of mature camels ranged from 514 to 645 kg for males and 470 to 510 kg for females respectively. The live weights of Iranian camels of five years of age ranges between 340 and 430 kg (Kadim *et al.,* 2008). As shown in Table 2, body weight at slaughtering was significantly affected by sex (P< 0.001) and by genotype (P< 0.05). The slaughtering body weight of males was higher than that for females. In addition, The Bacteria×Dromedary crossbred camels had significantly (P< 0.05) heavier slaughter body weight than the Dromedary camels. Asadzadeh *et al.* (2010) reported the weight of one-year-old male and female Iranian camels for crossbred as 230±26.6 and 206±33.8 kg while for Dromedary as 211±23.7 and 194±9.3 kg, respectively.

Table 1. Overall Means±standard error for live body weight and for carcass characteristics of: thickness, breaking load, tensile strength and elongation of the camels' (parallel and perpendicular) hide samples.

Characteristics		Mean±SE	CV[a]	Min[b]	Max[c]
Initial live body weight (kg) (13 month old)		295±8.6	15.2	201	394
Slaughter body weight (kg) (21 month old)		356±9.7	13.6	286	464
Hot carcass weight (kg)		218±6.4	14.9	166	291
Cold carcass weight (kg)		211±5.9	13.8	162	274
Hot carcass dressing out (%)		60.3± 0.8	8.0	54.2	74.7
Cold carcass dressing out (%)		58.8±0.7	6.0	53.8	72.0
Wet hide weight (kg)		31.7±0.9	15.6	23.7	44
Dry hide weight (kg)		20.8 ±0.9	23.2	12.7	30
Hide thickness (mm)		3.35± 0.1	15.5	1.9	5.2
Leather thickness (mm)		1.9 ±0.1	15.8	1.5	3.1
Leather area (m^2)		2.3 ±0.6	13.5	1.7	3.3
Breaking load (kgf)		36.2±2.4	32.6	19.7	64
Tensile strength (kgf cm^{-2})		210 ±18.0	43.8	80.8	408
Elongation (%)		62.1±2.6	21.4	37.0	87
Breaking load (kgf)	Par[d]	36.5 ±2.9	40.2	16	73
	Per[e]	35.9± 2.2	31.2	14.7	55
Tensile strength	Par	208 ±21.1	50.7	78.2	449
(kgf cm^{-2})	Per	195 ±14.7	37.7	47.9	338
Elongation (%)	Par	59.3±2.5	20.8	38.8	83
	Per	64 ±3.9	30.7	35.2	106

[a] Coefficient of Variation (%), [b] Minimum observed value; [c] Maximum observed value; [d] Parallel, [e] Perpendicular.

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Table 2. Effect of genotype and sex on: camel live body weight, hot and cold carcass weights and as well on hide (Mean±Standard error)[a].

Characteristics	Body weight (kg)		Carcasses (kg)		Hide (kg)	
	13 month old	Slaughter	Hot	Cold	Wet	Dry
Genetic group	*	*	ns	ns	ns	ns
Dromedary	279 ± 11.1	339±10.7	211 ± 7.7	201±7.3	30.7 ± 1.2	20.2±1.2
Crossbred	312 ± 11.5	372 ± 11.1	226 ± 8.3	221 ± 7.3	32.5 ±1.2	21.3±1.3
Sex	ns	***	**	*	**	ns
Male	307 ± 11.1	382± 9.7	234±7.9	223 ± 7.3	33.9± 1.2	22.4 ± 1.2
Female	284 ± 11.5	326 ± 10.6	203 ± 7.9	198 ± 7.3	29.3 ± 1.2	19.1 ±1.3
Genetic group×Sex	ns	ns	ns	ns	ns	ns

[a] In this table and in the following ones: *= Effect is significant at $P< 0.05$; **= Effect is significant at $P< 0.01$; ***= Effect is significant at $P< 0.001$, ns= Effect is not significant at $P< 0.05$.

Researchers found no sex differences for live weights of camel at early ages but at the later ages, males had significantly heavier live body weights than females (Kadim *et al.,* 2008; Asadzadeh *et al.,* 2010). Sex differences become evident and remarkable when camels become mature (Ouda *et al.,* 1992; Ouda, 1995). In Bactrian camels, Zhang (1981) reported no significant differences between the live weights of males and females at yearling age (235 and 236.8 kg for males and females, respectively). However, Asadzadeh *et al.* (2010) reported more live weight for the fattened males compared with fattened females at 21 months of age (376.7±18.6 vs. 342.0±18.6 kg).

Carcass Weight

The hot and cold carcass weights in the current study ranged between 166 to 291 kg and 162 to 275 kg, respectively (Table 1). The hot and cold carcass weights were significantly affected by sex (P< 0.01; P< 0.05). A wider range of carcass weight (125 to 400 kg) was reported for different types of camels by Kadim *et al.* (2008), which was due to different sexes, breed differences and age at slaughtering. According to Qarahdaghi *et al.* (2008), 205 kg is the average carcass weight of Iranian camels. This low slaughter body weight might be due to age factor because their study comprised young camels. A study on biometric characteristics of Iranian camels by Emami Meybodi *et al.* (2007) showed that the average carcass weights of Kalkuei, Baluchi and Turkman camels were 190, 220 and 187 kg, respectively.

In the present study, the dressing out percentages was 60.3 and 58.8 percent for hot and cold carcass weights, respectively (Table 1). Knoess (1977) and Tandon *et al.* (1988) showed that the dressing–out% varied from 55 to 70 percent. Kadim *et al.* (2008) reported dressing-out% of 55.9 percent for hot carcasses and 54 percent for cold carcasses in Sudanese male camels. Farzad *et al.* (2004) reported that the values for dressing–out percentage were 47±0.6, 49±0.6, 52±0.7 and 51±0.9% for carcasses from one to four years of age camels, respectively. Farzad *et al.* (2004) suggested that the highest dressing-out percentage can be obtained from camels at three years of age.

Hide and Leather Characteristics

The results of the present study indicated that the effect of genetic group on the wet and dry hide weights was not significant (P> 0.05). While the males (33.9±1.2 kg) had

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significantly ($P< 0.05$) heavier wet hides than females (29.3±1.2 kg), there was no sex effect observed on dried hide weights of camels (Table 2). Mrai and Khalil (2000) studied the body and skin growth rate of the two sexes of camels between one to 18 months of age and reported that the skin weight and skin area of males and females increased with age, but the rate of increase was lower than that observed for body weight.

Little information is available on physical characteristics of a camel's leather, which is surely needed for its further processing. Adel and Elboushi (1994) reported that the differences among animals concerning skin thicknesses might be due to breed, varieties, age, sex and the body site from where the specimen is taken. However, in sheep and goats, Abdelsalam and Haider (1993) observed that the thickness of hide and leather, sampled out from different sites of an animal's body did not differ. In Egyptian camels, the average thickness for hide and leather were reported 3.5 and 1.9 mm, respectively (Abdelsalam and Haider 1993), close to the present study results.

The current results indicated that there was no significant difference observed between right and left sides of a camel's hide as regards thickness (P> 0.05). In addition, the thickness of various parts of camel hides (shoulder, flank and rump) did not show any difference, but there was a significant difference observed regarding the thickness of hide around neck as compared with the thickness of hide in other parts studied (P< 0.05, Table 3). Moreover, no significant difference (P> 0.05) was observed between the two sexes and genetic groups (Table 3). Salehi *et al.* (2010) reported the thickness of skin for Iranian native goats between 0.8 and 3 mm. Moreover, they reported significant effects of sex, age, genotype and sample site on the thickness of skin.

The standards for the characteristics of cloth leather (calf, goat, sheep and splitting of cow hide) and the cow leather are specified. The values for tensile strength were 150 kgf cm^{-2} for cloth leather and 180 kgf cm^{-2} for cow leather. These values for the percentages of elongation at break point ranged from 50 to 90% for cloth leather and from 40 to 90% for cow leather, respectively (British Standards, 1984). The average tensile strength and the percentage of elongation at break point of the camel leather, obtained in this study (Table 1), were in general higher than those reported for cloth and cow leather.

The average tensile strength of the parallel and perpendicular test pieces are shown in Table 1. The current results indicated that the breaking force and the tensile strength of parallel leather samples were higher while the percentage of elongation lower than

Table 3. Effect of genotype and sex on dry hide thickness (mm) in different right and left body sites of one hump *vs.* crossbred camels (Mean±Standard error).

Characteristics	Neck[a]	Shoulder		Flank		Rump	
		Right	Left	Right	Left	Right	Left
Genetic group	ns	ns	ns	ns	ns	ns	ns
Dromedary	3.7±0.1	3.3 ± 0.2	3.6 ± 0.2	3.4 ± 0.1	3.6 ± 0.2	3.4 ±0.1	3.9 ± 0.1
Crossbred	3.7 ± 0.1	3.9 ± 0.2	3.1 ± 0.2	3.4 ± 0.1	3.1 ± 0.2	3.3 ± 0.2	3.4 ± 0.1
Sex	ns	ns	ns	ns	ns	ns	ns
Male	3.6 ± 0.1	2.9 ± 0.1	3.3 ± 0.2	3.3 ± 0.2	3.3 ±0.2	3.4 ± 0.1	3.5 ± 0.1
Female	3.9 ± 0.1	3.3 ± 0.2	3.3 ± 0.2	3.2 ± 0.1	3.3 ±0.2	3.2 ±0.1	3.3 ± 0.1
Genetic group×Sex	ns	ns	ns	ns	ns	ns	ns

[a] The difference between the thickness of hide around the neck and thickness of hide around the other parts was observed as significant.

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those for the perpendicular samples (Table 5). Sivasubramaniana *et al.* (2008) reported that tensile strength of goat skin ranged from 203 to 255 kgf cm^{-2} and from 153 to 204 kgf cm^{-2} for the parallel and perpendicular samples, respectively. The values of these traits for cattle hide ranged from 255 to 306 kgf cm^{-2} and from 204 to 255 kgf cm^{-2}, respectively. They also noted that the elongation at the break point of parallel and perpendicular samples were 40–80% and 60–80% for goatskin and cattle hide, respectively.

In the present study it was shown that the sex and genetic group did not significantly affect (P> 0.05) on the physical characteristics of the leather (Table 4). Salehi *et al.* (2010) reported the ranges for strength and elongation at break point of leather in Iranian native goats of 66 to 435 kgf cm^{-2} and 30 to 129%, respectively. In addition, they reported that these characteristics were significantly affected by sex, age and genotype. For Balady goats, the elongation at break point and strength of skin of flank and rump regions were significantly different at 6 months of age (Abdelsalam and Haider, 1993). Moreover, a study on the tensile strength of Merino sheep leather showed that the tensile strength was highly dependent on the sample position and its orientation with respect to the backbone. According to Gordon (1995), the strength of samples taken in parallel to the backbone decreased as the distance from the backbone increased.

The breaking force and tensile strength generally decreased as the leather thickness increased. The correlation coefficients of the leather thickness with the breaking force and the tensile strength in parallel and perpendicular leather samples were -0.6 *vs.* -0.5, and -0.8 *vs.* -0.7, respectively (P< 0.001; Figures 1-a and b). The value of -0.55 was found for the correlation between the leather thickness and the percentage of elongation.

Table 4. Effect of genotype and animal's sex on leather size, breaking load, tensile strength and elongation of one hump *vs.* crossbred camels (Mean±Standard error).

Characteristics	Leather size (m^2)	Breaking load (kg)	Tensile strength (kgf cm^{-2})	Elongation (%)
Genetic group	ns	ns	ns	ns
Dromedary	2.3±0.1	38.1± 3.2	214.7 ± 25.2	61.0 ± 3.7
Crossbred	2.3 ± 0.1	33.7 ± 3.6	203.6 ± 27.1	63.4 ± 4.0
Sex	ns	ns	ns	ns
Male	2.4 ± 0.1	33.3 ± 3.4	192.7 ± 36.1	60.9 ± 3.8
Female	2.3 ±0.1	38.4 ± 3.3	225.6 ± 26.1	63.5 ± 3.8
Genetic group×Sex	ns	ns	ns	ns

Table 5. Physical properties of longer side [parallel (Par) *vs.* perpendicular (Per) to the backbone] specimens of the leather.

Characteristics	Breaking load (kg)		Tensile strength (kg f cm^{-2})		Elongation (%)	
	Par	Per	Par	Per	Par	Per
Genetic group	ns	ns	ns	ns	ns	ns
Dromedary	38.2 ±4.4	36.7 ± 3.2	213.8 ± 28.9	196.4 ± 21.3	58.7 ± 3.6	63.2 ± 5.7
Crossbred	34.3 ± 1.2	34.6 ± 3.3	199.9 ± 30.1	190.5 ± 21.8	60.1 ± 3.7	64.7 ± 5.8
Sex	ns	ns	ns	ns	ns	ns
Male	32.1± 4.2	34.0 ± 3.5	174.5 ± 30.1	182.4 ± 22.8	60.0 ± 3.7	61.3 ±6.2
Female	40.5 ± 4.1	37.3 ± 3.1	239.2 ± 28.9	204.4 ±20.3	58.7 ± 3.5	66.6 ± 5.5
Genetic group×Sex	ns	ns	ns	ns	ns	ns

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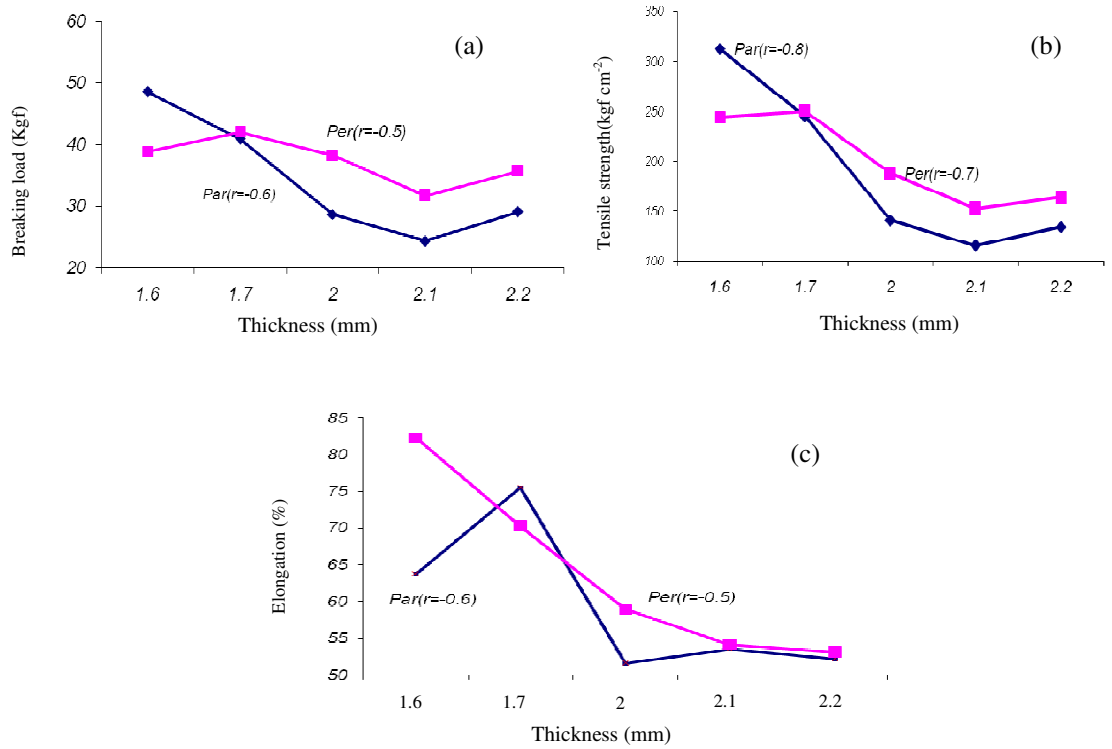

Figure 1. The trend of breaking force observed (a), the trend of tensile strength observed (b), the trend of elongation at breaking point observed (c), with increase in the thickness of the (perpendicular *vs.* parallel) leather samples.

In the perpendicular leather sample, the percentage of elongation decreased as the leather thickness increased. The percentage of elongation of parallel leather samples was 65% where the leather thickness was 1.6 mm. It increased to 80% when the thickness increased to 1.7 mm and then sharply decreased to 51% when the thickness increased up to 2 mm (Figure 1-c).

The dry and wet hide weights increased when the slaughter and carcass weights (cold and hot) increased. The correlation figures of slaughter weight with wet and dry hide weights were 0.8 and 0.7, respectively. A range of 0.5 to 0.8 was found for the correlation of carcass weight (cold and hot) with wet and dry skin weights. In addition, the correlation between wet skin weight and salted dry skin weight was obtained as 0.7. Moreover, the correlation of the leather size with slaughter weight, carcass weight and skin weight were low (-0.05 to -0.30; P< 0.001). Trimming and separating the skin of hump were the possible reasons for the negative correlations. In an Australian experiment conducted on sheep and lambs, it was shown that the skin surface can be predicted accurately using carcass weight (Campbell and Hopkins, 1996). As for camel, the prediction of the hide area and the leather size using carcass weights needs further study.

CONCLUSIONS

The current results showed a significant difference in slaughter weight between the pure Dromedary and its Bactrian crossbred. In addition, males and females had different carcass weights and wet hides. The difference between males and females

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regarding the thickness of hide was non-significant. Breaking force, tensile strength and elongation of the leather samples decreased with increase in their thicknesses. Throughout the present study it was concluded that the leather from camel benefited from such desirable mechanical characteristics as tensile strength and extension measures. The study also concluded that selection for body weight will also result in improvement of quality of the leather. Standard hide processing methods can be further employed to improve the quality of camel leather.

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ارزیابی وزن زنده، خصوصیات لاشه و چرم شترهای یک کوهانه و شترهای آمیخته دوکوهانه * تک‌کوهانه

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چکیده

هدف از این مقاله ارزیابی وزن بدن، وزن لاشه و خصوصیات پوست و چرم شترهای تک کوهانه و آمیخته‌ها (نر دوکوهانه * ماده تک‌کوهانه) بود. چهارده شتر ۲۱ ماهه از دو جنس (نر و ماده) مورد استفاده قرار گرفت. وزن کشتار، وزن لاشه سرد و گرم، درصد بازدهی لاشه و خصوصیات پوست تر، پوست خشک‌نمکی و چرم اندازه‌گیری شد. وزن کشتار شترهای یک‌کوهانه و آمیخته (۱۰/۷±۳۳۹ در برابر ۱۱/۱±۳۷۲ کیلوگرم) و نیز شترهای نر و ماده (۹/۷±۳۸۲ در برابر ۱۰/۶±۳۲۶ کیلوگرم) با یکدیگر تفاوت معنی‌دار داشت. به‌علاوه اثر جنس بر روی وزن پوست تر (۱/۲±۳۴ و ۱/۲±۲۹/۳ کیلوگرم بترتیب برای نر و ماده) معنی‌دار بود، ولی اختلاف معنی‌داری بین شترهای نر و ماده از لحاظ ضخامت پوست بدست نیامد (P >۰/۰۵) . نیروی پارگی، مقاومت کششی و ازدیاد طول نمونه‌های چرم با افزایش ضخامت چرم کاهش یافت. این مطالعه نشان داد که چرم شتر از خصوصیات خوب مکانیکی مانند مقاومت کششی و کشش‌پذیری برخوردار بوده و در ضمن از نظر این صفات تفاوتی در چرم شترهای نر و ماده و گروه‌های ژنتیکی مختلف وجود نداشت.

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