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Description of the main attributes (origin, gender, age, body condition, and slaughter weight) at slaughter house arrival and their impact on carcass characteristics from cull Quarter Horse

Descripción de los principales atributos (origen, sexo, edad, condición corporal y peso de sacrificio) a la llegada al matadero y su impacto en las características de la canal del caballo Cuarto de Milla de descarte

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ABSTRACT

In order to describe the effects of origin (Mexico and United States of America), sex, age at slaughter (AS, 4 categories), body condition score (BCS, 5 categories) and slaughter weight (SW, 4 categories) on carcass characteristics of culled quarter horses, data from 235 horses sacrificed in the same slaughter facility within a 150 days period were analyzed. Overall, 74.5% were from the US, 80% were < 15 years of age and had BCS ≤ 4, and sex proportion was similar (51.5% female vs 48.5% males). Horses from USA had heavier SW (27%), leg circumference (4%), carcass weight (4.2%) and carcass yield (2.9%). Sex did not affect any characteristics evaluated. Horses from 3 to 8 years had greater rib eye area (REA) and backfat thickness. Except for leg length, as BCS and SW improved, all carcass characteristics linearly increased as BCS and SW increased. It is concluded that origin, sex, and age, explained very little on the carcass characteristics. The slaughter weight mainly explained changes in linear measures, carcass weight, and compact index, while BCS mainly explained carcass yield and REA.

Keywords: Equine, Quarter horse, attributes at slaughter, carcass traits.

RESUMEN

Para describir los efectos de origen (México y Estados Unidos de América), sexo, edad al sacrificio (AS, 4 categorías), puntaje de condición corporal (BCS, 5 categorías) y peso de faena (SW, 4 categorías) se utilizaron datos de 235 caballos cuartos de milla sacrificados en una misma instalación durante un período de 150 días. Del total, el 74.5 % provenían de EUA, el 80 % fue <15 años y una BCS ≤ 4, la proporción de sexos fue similar (51.5 % hembras vs 48.5 % machos). Los caballos EUA presentaron mayor SW (27 %), circunferencia de pierna (4 %), peso en canal (4.2 %) y rendimiento en canal (2.9 %). El sexo no afectó ninguna característica evaluada. Los caballos de 3 a 8 años presentaron mayor área del ojo de la costilla (REA) y grasa dorsal. Exceptuando la longitud de pierna, las características de la canal aumentaron linealmente a medida que aumentaron BCS y SW. Se concluye que origen, sexo y edad explican poco sobre las características de la canal. El peso al sacrifico explicó principalmente los cambios en las medidas lineales, peso de la canal e índice compacto, mientras que BCS explicó principalmente el rendimiento de la canal y REA.

Palabras clave: Equino, cuarto de milla, atributos al sacrificio, rasgos de canal

INTRODUCTION

A relationship between horses and humans has existed for around 12,000 years. There is evidence that, before horse domestication, their first use was as a food source (Hintz, 1995). Currently, meat horse production represents 0.24 % of total world meat production (~740 thousand tons), and has remained without significant changes over the last decades (FAOSTAT, 2018).

The estimated per capita worldwide consumption of equine meat is 0.10 kg, traditionally the main consumers are European countries, although there are those such as Mexico which stands out in horse meat production and export; although, the acceptability of this meat by Mexican consumers is still unknown (Gill, 2005). Even though horse meat has properties that can be considered as a "healthy meat" (Lorenzo *et al*., 2010), is not popular in most countries as food for humans. It has been corroborated that regular consumption of horse meat significantly reduces serum levels of total cholesterol and low-density lipoproteins, while increasing polyunsaturated fatty acids levels which it's improving people's health (Del Bó *et al*., 2013). Currently, a major concern for consumers is to demand that foods have passed a rigorous classification and evaluation process be-

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fore being introduced to the market. Even though in Mexico there are well-defined regulations and procedures to classify beef, sheep, pork and poultry meat (taken into consideration age and weight at slaughter, sex, and body conditions score, among others), in the case of horses there is little information in this regard, even though the amount of horses being slaughtered is increasing. Hence, the establishment of regulation protocols becomes more relevant because a large part of the horses slaughtered in Mexico come from outside the country. For this reason, the objective of this study was to determine the effects of sex, age and weight at slaughter, and body condition score on culled quarter horse carcass characteristics. Due to the important proportion of horses from USA that are sacrificed in Mexico, origin (USA and Mexico) was include as factor in the study.

MATERIAL AND METHODS

Sample size, slaughter procedures, data registration

In order to describe the effects of origin (Mexico and United States), sex, age at slaughter (AS, 4 categories), body condition score (BCS, 6 categories) and slaughter weight (SW, 4 categories) on carcass characteristics of culled quarter horses, data from 235 horses sacrificed during a 150 days period (January to May) in Federal Inspection Type # E 42 processing plant (Empacadora de Carnes de Fresnillo, S.A. de C.V., Fresnillo City, Zacatecas, México, located in the north-central region of México 23°11′08.75″N and 102°51′49.95W) were analyzed.

Horse were stunned (captive bolt), exsanguinated and skinned following the Federal Mexican standard rules (NOM-033-SAG/ZOO-2014, slaughter methods of domestic and wild animals). Two weekly visits were made to slaughterhouse facility during a period from January to May 2017. During this period, a total of 2300 horses were slaughtered, within these horses, we randomly choose horses until completing a sample size of 235 horses (10 % of total). Different categories were assigned according to each factor as follows: origin (2 categories; Mexican and USA), sex (2 categories; males and females), age (4 categories; <3, 3 to <8, 8 to 15 and >15 years), body condition score (BCS, 6 categories, 1=emaciated, 6=obese), and 4 categories for slaughter weight (SW, 151-250, 251-350, 351-450 and >450 kg). The individual SW was obtained in a digital livestock scale (TORREY, 0PG-2000, CIMSA, Zacatecas, Zacatecas) before horse immobilization, BCS was determined visually when animals were in the processing line just before slaughter according to a system established by the University of Kentucky (Wood, 1995), sex was also visually determined in the processing line (all males arrived castrated), origin according to skin branding and by the mobilization papers, age was determined after slaughter by dentition study following procedures described by Richardson *et al.* (1995).

After all carcasses were ready to be move into a cold chamber, hot carcass weight (HCW) was obtained, considering total body weight after horses were bled, skinned, eviscerated, and head and limbs removed, utilizing an aerial digital scale (Sipel, model R600, Rosario, Argentina). Immediately after split carcasses entered the cold chamber, measurements of the rib eye area (REA) and backfat thickness (FT) between the 12th and 13th rib were obtained by means of ultrasonography (ALOKA, ProSound 3500, Seattle WA, USA), after this procedure, morphometric measurements of the left carcass were performed, this included carcass length, chest depth, leg length and leg circumference (De Boer *et al.*, 1974). From this data, the compactness index was calculated as the cold carcass weight divided by the carcass length, the above, as a means to estimate the amount of meat in the carcass. After carcasses chilled in a cooler at -4 to 1°C for 24 h, the cold carcass weight (CCW) was registered, difference between HCW and CCW was considered as cooling loss (CL). Hot carcass yield and cold carcass yield were calculated as a percentage of SW.

Statistical analyses

All the data were tested for normality using the Shapiro-Wilk test. The MIXED procedure of SAS was used to analyze the variables origin and sex. For variables assigned with categories (AS, BCS, and SW)

The best fit linear model used were:

For age: $Yijklm = \mu + Oi + Sj + ASk + \varepsilon ijklm$

For BCS: $Yijklm = \mu + Oi + Sj + BCl + \varepsilon ijklm$

For AS: $Yijklm = \mu + Oi + Sj + SWm + \varepsilon ijklm$

Coefficients for polynomial contrasts (linear, quadratic and cubic effects of age, BCS, and SW) with unequal spacing were determined. In addition, separation of the means by T-test multiple comparisons between categories in each variable (AS, BCS, and SW) were performed. Difference were considered significant when the P-value was ≤0.05, and tendencies identified when the P-value was >0.05 and ≤0.10. Polynomials were considered significant when the P-value was ≤0.05, and tendencies were identified when the P-value was >0.05 and ≤0.10.

RESULTS AND DISCUSSION

Overall, the average slaughter weight was 364.6 ± 90 kg. Adult quarter horse can weight from 400-570 kg, the lower weight registered in this study was mainly due by the lower BCS and weight loss during transportation and management. A 74.5 % of slaughter horse were from the United States of America (USA). This large proportion of horses coming from the USA for slaughter in Mexico is due to the closure of horses slaughter plants in the United States by the law "American Horse Slaughter prevention", which prevents the slaughter of equines for human consumption in that country (112th Congress act 2011-2012). Accordingly, USA horse exports for slaughter increased by 148 and 660 percent to Canada and Mexico, respectively (Forrest, 2017, The Atlantic Journal). Almost 50 % of slaughtered horses were 8 years old or older, and had lower BCS. This can be explained since currently horse meat producers in USA have decreased. As expected, sex proportion was similar (51.5 % female vs 48.5 % males).

Horses from USA had a heavier (P<0.05) SW (389 vs 283 kg), greater leg circumference (4 %) and compactness index (4.4 %), heavier HCW (215 vs 206 kg), and greater carcass yield (59.02 vs. 57.29 %) without difference on REA nor BFT when compared to Mexican horses (Tables 1 and 2). This could be due to the different production systems used in each country; since these are not well defined they cannot be evaluated as these animals fulfill different functions, not as food animals. Franco *et al.* (2013) mentioned that the differences in the carcass morphometric measurements are related to the different genotypes, and not by feed, when are raised in similar production systems. Either way, previous reports had denoted that carcass performance in horses is highly variable. For example, Lanza *et al.* (2009), similar to our findings, registered a 59 % carcass yield in Sanfratellano and Haflinger horses. However, carcass yields up to 67 % have been reported for Burguete horses with ages between 16 and 24 months and a SW close to 400 kg. This is in agreement with carcass yield of 65 and 68 % registered for Burguete and Hispano-Breton horses slaughtered at 18 months of age with a SW around of 400 kg (Juárez *et al.*, 2009). In opposite, Franco *et al.* (2013) reported carcass yields of 50 and 52 % in Gallego de Monte breed horses and their crosses with Hispano-Breton. Furthermore, a carcass yield as low as 47 % was reported 15 month-old Gallego de Monte horses with a SW below 200 kg. As discussed below factors such as the BCS and SW are important to explain carcass yield in horse.

Tabla 1. Frecuencia y distribución de las características evaluadas de los caballos Cuarto de Milla sacrificados según el lugar de origen: México o Estados Unidos (EE.UU)

Table 1. Frequency and distribution of evaluated characteristics of slaughtered Quarter Horses according to place of origin: Mexico or Unites States (USA).

	Origin	
	México	**USA**
N	60	175
Frequency, %	25.5	74.5
Slaughter weigh, kg	293.2	389.1
Males	31 (51.7%)	92 (47.5%)
Females	29 (48.3%)	83 (52.5%)
Years of age		
<3	25 (41.7%)	35 (20.0%)
3 a<8	10 (16.7%)	55 (31.1%)
8 a <15	12 (20.0%)	52 (29.7%)
>15	13 (21.7%)	33 (18.9%)
Body score condition [1]		
1	13 (21.7%)	26 (14.9%)
2	19 (31.7%)	40 (22.9%)
3	19 (31.7%)	44 (25.1%)
4	6 (10%)	25 (14.3%)
5	2 (3.3%)	18 (10.3%)
6	1 (1.7%)	14 (8.0%)
7	0 (0.0%)	8 (4.6%)

[1] body condition score 1= emaciated, 5= obese.

Tabla 2. Medias de mínimos cuadrados de las características de la canal de caballos Cuarto de Milla de según su origen

Table 2. Least square means of Quarter Horse carcass characteristics according to their origin.

	Origin		
	México	USA	MSE
N	60 (25.5%)	175 (74.5%)	
Carcass characteristics			
Longitude, cm	129.0	129.6	1.26
Chest depth, cm	78.1	77.2	0.76
Leg length, cm	84.3	83.3	0.79
Leg circumference, cm	96.6[a]	100.4[b]	1.08
Compactness index	1.52[a]	1.59[b]	0.02
Hot carcass weight, kg	206.1[a]	215.1[b]	3.69
Cold carcass weight, kg	200.5[a]	209.4[b]	3.66
Hot carcass yield, %	57.29[a]	59.02[b]	0.64
Cold carcass yield, %	55.61[a]	57.38[b]	0.36
Cooling loss, %	1.68	1.66	0.06
Rib eye area, cm^2	41.91	42.79	1.26
Backfat thickness, mm	1.04	1.12	0.03

[a,b] Literals between columns indicate statistical differences (P<0.05).

Sex did not affect any characteristic evaluated (Table 3). This finding coinciding with those reported by Sarriés and Beriain (2005) and Lorenzo *et al.* (2013b). These researchers reported that there is no effect of sex, or an interaction with any other factor for carcass characteristics in horses. It is important to note that in our study all males were castrated, which would further minimize any possible difference attributed to gender

The effects of age at slaughter (AS) on carcass characteristics are shown in Table 4. As expected, AS significantly affected (P<0.05) carcass characteristics. Increasing AS, linearly increased (P<0.05) morphometric measures, compact index, and carcass weight. While cooling loss, REA, and BFT were shown a quadratic effect (P<0.05) being maximal values to horses for categories within from >3<15 years. The differences on carcass characteristics by age can be explained by different level of physiological development and by mature size depending of the breed, at greater age, greater morphometric and carcass measures expressed as absolute measures are expected (Sarriés and Beriain, 2005;

Tabla 3. Medias de mínimos cuadrados de las características de canal de caballos Cuarto de Milla según el sexo.
Table 3. Least square means of Quarter Horse carcass characteristics according to sex.

	Sex		
	Males	Females	MSE
N	114 (48.5%)	121 (51.5%)	
Carcass characteristics			
Longitude, cm	129.8	128.9	0.96
Chest depth, cm	77.8	77.5	0.58
Leg length, cm	84.3	83.3	0.61
Leg circumference, cm	98.3	98.7	0.83
Compactness index	1.55	1.55	0.02
Hot carcass weight, kg	211.5	209.6	2.82
Cold carcass weight, kg	205.8	204.0	2.79
Hot carcass yield, %	58.29	58.01	0.49
Cold carcass yield, %	56.62	56.32	0.48
Cooling loss, %	1.68	1.67	0.05
Rib eye area, cm^2	42.19	42.51	0.96
Backfat thickness, mm	1.08	1.08	0.04

^{a,b}Literals between columns indicate statistical differences (P<0.05).

Tabla 4. Medias de mínimos cuadrados de las características de la canal de caballos Cuarto de Milla según la edad.
Table 4. Least square means of Quarter Horse carcass characteristics according to age.

	Age (Years)				
	<3	3 a <8	8 a 15	>15	SEM
N	60 (25.5%)	65 (27.7%)	64 (27.2%)	46 (19.6%)	
Carcass characteristics					
Longitude, cm†	121.17^{a}	130.33^{b}	134.03^{c}	134.04^{c}	1.41
Chest depth, cm†	72.82^{a}	78.67^{b}	79.60^{b}	79.57^{b}	0.88
Leg length, cm†	81.08^{a}	84.33^{b}	85.45^{b}	86.87^{b}	0.98
Leg circumference, cm†	90.71^{a}	99.4^{b}	100.4^{b}	97.6^{b}	1.41
Compactness index†	1.53	1.54	1.55	1.58	0.03
Hot carcass weight, kg†	203.1^{a}	207.8^{ab}	213.1^{bc}	218.4^{c}	4.21
Cold carcass weight, kg†	197.5^{a}	202.1^{ab}	207.4^{bc}	212.6^{c}	4.09
Hot carcass yield, %	57.72	57.87	57.39	57.25	0.56
Cold carcass yield, %	56.90	56.30	56.02	56.73	0.71
Cooling loss, %§	1.80^{a}	1.64^{b}	1.61^{b}	1.69^{ab}	0.05
Rib eye area, cm^2§	40.32^{ab}	44.21^{a}	41.35^{ab}	36.51^{b}	1.44
Backfat thickness, mm§	0.98^{ab}	1.12^{a}	1.10^{a}	0.91^{b}	0.04

^{a,b,c}Literals between columns indicate statistical differences (P<0.05).
† Linear component (P<0.05).
§ Quadratic component (P<0.05).

Znamirowska, 2005). In our study, only carcass yield (expressed as %) was not affected by AS. In opposite, Sarriés and Beriain (2005) attributed improvements in carcass yields to age when evaluated carcass yield, when slaughter occurred at 16 and 24 months. It is important to indicate that 16 and 24 months of age is a very early growth period (low maturity level), and could impact carcass yield. It would be necessary to evaluate shorter age ranges and longer periods of growth (i.e. up to 72 months) in order to determine the maximal carcass yield point according to the horses age. In the case of the REA, it does occur in this manner, due to the fact that this show greater values for interim ages, decreasing in horses older than 15 years. Schauer (2015) reported that muscle characteristics in horses increase with age until reaching a peak (this is presented in all mammals species). Likewise, subcutaneous fat (BFT) seems to behave in the same manner decreasing in older animals.

The effects of BCS on carcass characteristics are shown in Table 5. As BCS increased, leg length linearly decreased, but increasing leg circumference enough to raise the compactness index value in horses. Similar than feedlot cattle (Apple *et al*., 1999; Minchin *et al*., 2009), as BCS increased, heavier carcass weight, greater REA, and a lower CL were registered. REA are related to rate of weight gain, and rate weigh gain is dependent of energy intake (which is correlated with fat deposition (Cunha, 1980). Thus, it is expected that horse that had better feeding system, greater gain rate and more body fat (and greater BCS), had greater REA values. It is well known that BCS were developed to assess the level of body fat proportion (based on subcutaneous fat index). Therefore, BCS is highly correlated with BFT (Henneke *et al.*, 1983; Gentry *et al.*, 2004).

Body condition score values in this study are lower than those previously reported (Schauer, 2015; Martin-Giménez *et al.*, 2016). As mentioned above, differences between studies can be attributed to differences in production systems (background of feeding and weight at slaughter) and by horse breed. The lower CL in horse with high BCS is explained by lower dehydration by greater fat cover (BFT) in carcass.

The most influential factor in carcass characteristics was SW, since it had a significant effect (P<0.05) on every characteristic evaluated (Table 6). As SW increased, carcass morphometric measurements (length, chest depth, leg length, leg circumference, and compactness index) also increased. Carcass weight (HCW and CCW) show the same behavior, with more pronounced increases (P<0.05). Same behavior appeared in the case of BFT, however, anatomical variations in fat deposition, which could confuse fatness estimates, could be different amongst different horse breeds (Martin-Giménez *et al*., 2016). Therefore, more ultrasonography studies on different anatomical areas are necessary,

Tabla 5. Medias de mínimos cuadrados de las características de la canal de caballos Cuarto de Milla según la condición corporal**.**
Table 5. Least square means of Quarter Horse carcass characteristics according to body condition score.

	Body condition score					
	1	**2**	**3**	**4**	**5**	**SEM**
N	**39 (16.6%)**	**59 (25.1%)**	**63(26.8%)**	**31 (13.2%)**	**43 (18.3%)**	
Carcass characteristics						
Longitude, cm§	130.5^{ab}	127.4^{a}	127.9^{a}	129.5^{ab}	133.2^{b}	1.69
Chest depth, cm†	75.98^{a}	75.45^{a}	77.42^{a}	77.56^{a}	80.02^{b}	1.02
Leg length, cm§	85.33^{a}	82.19^{ab}	84.40^{ab}	83.89^{b}	85.94^{b}	0.98
Leg circumference, cm†	88.76^{a}	91.33^{a}	98.56^{b}	102.8^{c}	108.1^{d}	1.56
Compactness index†	1.27^{a}	1.29^{a}	1.51^{b}	1.63^{c}	1.88^{d}	0.04
Hot carcass weight, kg†	172.5^{a}	172.9^{a}	200.8^{b}	218.8^{b}	259.8^{c}	7.54
Cold carcass weight, kg†	166.8^{a}	167.8^{a}	195.1^{b}	213.2^{b}	253.7^{c}	7.42
Hot carcass yield, %†	52.15^{a}	55.64^{b}	57.29^{c}	56.97^{c}	60.57^{d}	0.62
Cold carcass yield, %†	51.83^{a}	55.08^{b}	57.14^{c}	57.17^{c}	59.07^{d}	0.62
Cooling loss, %†	1.82^{a}	1.75^{a}	1.72^{a}	1.55^{b}	1.49^{b}	0.06
Rib eye area, cm^{2}†	27.70^{a}	38.45^{b}	44.42^{c}	47.25^{cd}	50.68^{d}	1.36
Backfat thickness, mm†	0.78^{a}	0.92^{a}	1.11^{c}	1.22^{cd}	1.24^{d}	0.08

a,b,c,d Literals between columns indicate statistical differences (P<0.05).
† Linear component (P<0.05).
§ Quadratic component (P<0.05).

Tabla 6. Medias de mínimos cuadrados de las características de la canal de caballos Cuarto de Milla según el peso al sacrificio.
Table 6. Least square means of Quarter Horse carcass characteristics according to slaughter weight.

	Slaughter weight (kg)				
	151-250	251-350	351-450	451-500	SEM
N	28 (11.9%)	72 (30.6%)	93(39.6%)	42 (17.9%)	
Carcass characteristics					
Longitude, cm†	113.7^{a}	127.7^{b}	134.5^{c}	141.5^{d}	1.32
Chest depth, cm†	66.75^{a}	76.29^{b}	80.48^{c}	86.53^{d}	0.77
Leg length, cm†	75.4.3^{a}	83.36^{b}	87.41^{c}	90.00^{d}	0.88
Leg circumference, cm†	79.48^{a}	92.68^{b}	104.01^{c}	113.82^{d}	1.24
Compactness index†	0.99^{a}	1.32^{b}	1.69^{c}	2.06^{d}	0.03
Hot carcass weight, kg†	116.81^{a}	173.62^{b}	233.34^{c}	299.95^{d}	4.25
Cold carcass weight, kg†	112.6^{a}	168.3^{b}	227.3^{c}	292.81^{d}	4.21
Hot carcass yield, %†	56.20^{a}	56.29^{a}	58.76^{b}	60.56^{c}	0.72
Cold carcass yield, %†	54.17^{a}	54.54^{a}	57.22^{b}	59.10^{c}	0.72
Cooling loss, %†	2.03^{a}	1.75^{b}	1.54^{c}	1.47^{c}	0.06
Rib eye area, cm^2†	32.17^{a}	37.31^{b}	45.62^{c}	52.68^{d}	1.67
Backfat thickness, mm†	0.85^{a}	0.94^{a}	1.13^{b}	1.31^{b}	0.06

[a,b,c,d] Literals between columns indicate statistical differences (P<0.05).
† Linear component (P<0.05).

to determine the areas with the greatest tendency for fat deposition of each breed of horses (Quaresma *et al.*, 2013). In the case of CL, it was inversely proportional to SW, that is, the heavier the horse, the lower CL value. As mentioned previously, CL is inversely related to carcass cover fat (BFT). The values of cooling loos registered in this study are consistent with those reported by Franco *et al.* (2013) and Lorenzo *et al.* (2013a), which range between 2 and 3%. But not with Sarriés and Beriain (2005), who reported cooling loos values as large as 13%. Generally, REA size is proportional with body size and degree of body fatness, therefore it is expected that at greater SW greater REA. Although, it is necessary to consider the fact that heavy animals are not necessarily fat and light animals are not necessarily thin either, which would directly affect the REA. Even still, ultrasound measurements for equine muscles are reliable and repeatable (Abe *et al.*, 2012). In feedlot cattle, in which there are countless studies related to factors that affect REA, the production system and nutritional status affect body size and degree of fatness same affecting REA size (Yokoo *et al.*, 2008).

Coefficient determination (R^2) between factors and variables registered are shown in Table 7. Origin, sex and age explained very little ($R^2 \leq 0.20$) its effects on carcass characteristics, while SW mainly explained the changes in linear measurements ($R^2 \geq 0.40$) and carcass weight ($R^2 = 0.55$), while BCS mainly explained carcass yield characteristics ($R^2 = 0.27$) and REA ($R^2 = 0.42$). Since these variables are not only affected by the factors assessed (origin, sex, AS, BCS and SW), low R^2

Tabla 7. Coeficientes de determinación (R^2) para las características de la canal de acuerdo a las variables de llegada al sacrificio.
Table 7. Determination coefficients (R^2) for the characteristics of the carcass according to the variables of arrival at slaughter.

Variable	Origin	Sex	Age	BCS	SW	MSE
Carcass characteristics						
Longitude, cm	0.1112	0.0050	0.2082	0.0345	0.5142	0.1269
Chest depth, cm	0.0863	0.0024	0.1329	0.1306	0.5809	0.0669
Leg length, cm	0.0516	0.0163	0.1150	0.0211	0.3983	0.3977
Leg circumference, cm	0.1798	0.0000	0.0419	0.2659	0.5124	0.0000
Hot carcass weight, kg	0.1465	0.0016	0.0700	0.2299	0.5521	0.0000
Compactness index	0.1512	0.0006	0.0437	0.2848	0.5197	0.0000
Cold carcass weight, kg	0.1463	0.0015	0.0691	0.2324	0.5507	0.0000
Hot carcass yield, %	0.1143	0.0000	0.0001	0.2668	0.1747	0.4441
Cold carcass yield, %	0.1238	0.0000	0.0000	0.2852	0.2000	0.3910
Cooling loss, kg	0.0843	0.0032	0.0851	0.0466	0.3653	0.4155
Cooling loss, %	0.0587	0.0004	0.0170	0.1097	0.2021	0.6121
Rib eye area, cm^2	0.1095	0.0003	0.0066	0.4203	0.3439	0.1194
Backfat thickness, mm	0.0858	0.0000	0.0004	0.2147	0.1920	0.5071

BCS: Body condition score; SW: Slaughter weight.

values (R^2<0.50) can be expected despite the fact that the effect is significant (P≤0.05). Unlike the factors of origin, sex and age of the horses, factors such as SW and BCS are strongly related, thus, represent greater R^2values.

CONCLUSION

Origin, sex and age, per se, explained very little its effect on the carcass characteristics. SW mainly explained changes in linear measures and carcass weight, while BCS mainly explained carcass yield and REA.

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