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Determining The Yields and Percentages of Retail Cuts From Holstein Bull Carcasses Marketed in South Marmara Region of Turkey

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ABSTRACT

The objective of this study was to determine further-processing characteristics and share of valuable cuts in Holstein carcasses marketed in South Marmara Region of Turkey. The data-set collected from a commercial slaughterhouse included observations of 311 purebred Holstein bulls. The mean values were determined 510.27±5.11 kg for pre-slaughter weight, 273.07±2.75 kg for hot carcass weight and 53.57±0.15 % for hot carcass dressing. Mean cold-carcass weight was 266.34±2.67 kg and mean carcass bone content was 19.05±0.09 %. In addition, the means for valuable cuts including rib, roast, sirloin, cutlet and strip loin were 17.17±0.19 kg, 3.35±0.05, 2.74±0.04 kg, 8.74±0.11 kg and 4.65±0.06 kg, respectively. Total yield of valuable retail cuts were 36.66±0.42 kg with the percentage of 13.74±0.06 % and the processing loss was 8.19±0.11 kg with the percentage of 3.11±0.04 %. Statistical analysis revealed that highly significant differences were observed between slaughter age groups. Moreover, significant correlations were found between pre-slaughter / carcass weights and all carcass traits analyzed. The present results may be useful for an effective evaluation of carcass characteristics in beef market of Turkey.

Keywords: Beef Production, Carcass Characteristics, Retail Cut Yield, Valuable Cuts, Holstein

Türkiye'nin Güney Marmara Bölgesinde Piyasaya Sunulan Holstein Irkı Erkek Sığır Karkaslarında Perakende Parça Ağırlık ve Oranlarının Belirlenmesi

ÖZ

Bu çalışmanın amacı, Türkiye'nin Güney Marmara bölgesinde piyasaya sunulan Holstein karkaslarında ileri-işlem özellikleri ve değerli et oranlarının belirlenmesidir. Veri seti özel bir mezbahadan elde edilen 311 baş saf Holstein erkek sığıra ait verileri kapsamaktadır. Ortalama kesim öncesi ağırlığı 510.27±5.11 kg; sıcak karkas ağırlığı 273.07±2.75 kg; sıcak karkas randımanı ise % 53.57±0.15 olarak belirlenmiştir. Ortalama soğuk karkas ağırlığı 266.34±2.67 kg ve ortalama karkas kemik içeriği oranı ise % 19.05±0.09'dur. Bununla birlikte, biftek, rosto, bonfile, pirzola ve kontrfileden oluşan değerli et ortalamaları sırasıyla 17.17±0.19 kg, 3.35±0.05, 2.74±0.04 kg, 8.74±0.11 kg ve 4.65±0.06 kg'dır. Toplam değerli et verimi 36.66±0.42 kg, değerli et oranı % 13.74±0.06, ileri-işlem firesi 8.19±0.11 kg ve ileri işlem fire oranı % 3.11±0.04'tür. İstatistiksel analizler, kesim yaşı grupları arasında önemli farklılıkların bulunduğunu göstermiştir. Ayrıca, kesim öncesi ve karkas ağırlıkları ile incelenen tüm özellikler arasında anlamlı korelasyonlar bulunmuştur. Bu çalışmadan elde verilerin Türkiye sığır eti sektöründe karkas değerlendirmesinin etkili bir biçimde yapılabilmesi konusunda yararlı olacağı düşünülmektedir.

Anahtar Kelimeler: Sığır Eti Üretimi, Karkas Özellikleri, Perakende Parça Verimi, Değerli Et, Holstein

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INTRODUCTION

Total red meat production in Turkey has risen to approximately 1.2 million tonnes and approximately 91% of this production (1,059,196 tonnes), was composed of beef (Anonymous, 2018). However, inadequacy in beef production has resulted in high prices of red meat and importation of live animals and/or carcasses. Beef self-sufficiency in Turkey could better be achieved through research aimed to increase the maximum yield and quality gathered by individual cattle. Evaluating the ways to enhance the present situation in beef production and improvements in processing efficiency may presumably deliver gains to producers in terms of higher profitability and sustainability, while, gains to consumers in terms of lower beef retail prices and increased beef consumption (Hadi et al., 2002).

Slaughter and carcass trait evaluation of beef production among breeds representing a wide range of biological types of cattle provides a basis for characterization in respect to yield of salable product for gross measures of productivity (Jenkins et al., 1981). The Holstein-Friesian breed is predominant among dairy cattle in general and is accepted as a significant premier dairy breed with a high potential for milk production (Jurie et al., 2007) but, not negligibly, this breed is also suitable for the production of good quality beef (Węglarz, 2010; Nogalski et al., 2016). Holstein beef have been not so popular and applied limitedly in countries which can be evaluated as self-sufficient for beef production, such as USA, Korea and Canada, because not only they have inferior palatability characteristics as compared to beef-specific breeds, but also their poor eating quality does not make it a highly-preferred choice correspond to retail for consumers (Yim et al., 2015). However, evaluation of the dual capacity of the Holstein breed may be considered in several countries where both milk and meat are in short supply, and moreover, Holstein bulls pedigree selected for superiority in milk production have the capacity to produce beef and a potential for improvement in beef production according to their genetic variability for beef traits (Calo et al., 1973). In Turkey, cattle population has risen to 14.7 million (Anonymous, 2018). Of this population, Holstein breed has a significant impact on Turkish animal husbandry, with 5.5 million purebreds and 856 thousand crossbreds (Anonymous, 2016). Hence, Holstein's potential for improvement in beef production should be paid sufficient attention when evaluating Turkish meat industry.

Assessment of carcass characteristics and evaluation of valuable retail cuts of beef should be considered as important constituents in profitable meat production. In Turkey, there is still a strong need for studies regarding ways to improve red meat production. Population growth rate and economic dynamics have resulted in dramatic increases in beef prices. In this sense, encouraging the studies on the determination of retail cut yields and carcass quality traits may play a key role for improvement in Turkey's meat industry. Therefore, the aim of this study was to assess carcass traits and valuable retail cut yield from Holstein bull carcasses marketed in South Marmara Region of Turkey and to evaluate the outcomes with respect to retrospective perspectives.

MATERIALS and METHODS

The study was carried out from January 1, 2016 to December 31, 2016. Data from a total of 311 carcasses cut into primal weights from Holstein bulls slaughtered in a commercial slaughterhouse (slaughter age: 17.59±0.084 months) located in South Marmara region of Turkey was used in the current study. Only data with relevant records of slaughter weight and carcass traits including retail cuts were used in subsequent analyses. Hence inaccurate and/or deficient records in a way that would not describe a complete picture of slaughter history for a bull were excluded from the analysis. Hot carcass weight was measured without removing the subcutaneous fat and keeping the kidney and pelvic fat and was taken approximately 1 h postmortem (Journaux, 2007). Each carcass was divided down the back-bone to give two sides. After chilling at 4 °C for 24 h in a ventilated room, carcasses were again weighed to determine the cold-carcass weight.

All cuttings and bones were weighed and their yields were expressed as percentages of the cold carcass weight. Carcasses were evaluated for weight means (kg) of valuable cuts including rib, roast, strip loin, sirloin, and cutlet. In addition, the proportions (%) of bone, valuable cuts, and total meat (valuable cuts + chunk and mince) were determined on the basis of cold carcass weight. In this context, sides were quartered between the 12th and 13th ribs. Bodies of the thoracic vertebrae were removed by sawing to the point where they joined the spinous processes and ribs, but leaving the spinous processes and ribs attached to the rib roast. The sirloin tip was removed by cutting across the anterior end of the muscle in a line with the anterior edge of the aitch bone (parallel to the sacral vertebrae) and the strip loin was separated from the round on a line between the aitch bone and the posterior end of the 5th sacral vertebra (Koch and Dikeman, 1977). Apart from the valuable cuts, the mean weights of mince and chunk yield were determined. Processing loss was

defined as the percentage of meat weight loss in consequence of carcass processing.

All the statistical analyses were performed using Minitab software (MINITAB®, USA, v17.1.0). Descriptive statistics were determined belonging to all variables and the data were expressed as means, their corresponding standard deviations, coefficient of variation, and minimum-maximum. Phenotypic correlation coefficients were generated using the Pearson's correlation coefficient (PCC) option of correlation procedures. In this study, phenotypic correlations were classified into three groups according to levels of PCC ranges: low correlation if PCC is < 0.30, intermediate correlation if PCC is between 0.30 – 0.70 and high correlation if PCC is >0.70 (Buyukozturk, 2002). In order to determine differences in age groups, a one-way analysis of variance (ANOVA) was performed and when significant differences were identified, the mean values for group were contrasted using Tukey's test.

RESULTS

A summary of the descriptive statistics expressing means, standard deviations, the coefficients of variation and minimum-maximum values is given in Table 1 for carcass processing traits and wholesale cut components from Holstein bulls marketed in South Marmara Region of Turkey. The mean pre-slaughter weight of the animals was 510.27±5.11 kg and the mean hot carcass weight was 273.07±2.75 kg with dressing percentage of 53.57±0.15 %. The values of Holsteins were determined 266.34±2.67 kg for cold carcass weight and 50.29±0.44 kg for bone content. In addition, chilling loss was between 0.03 % and 0.15 % with a mean of 0.07±0.01 % in the carcasses analyzed. The yields of mince and chunk were 134.26±1.76 and 20.08±0.21 kg respectively; while the yields of valuable cuts were 17.17±0.19 kg, 3.35±0.05, 2.74±0.04 kg, 8.74±0.11 kg and 4.65±0.06 kg for rib, roast, sirloin, cutlet and strip loin, respectively. Results revealed that, the mean value for processing loss was 8.19±0.11 kg in Holstein carcasses analyzed.

Table 1. Descriptive statistics of slaughter weight, carcass traits and further-processing characteristics in Holstein bulls (n=311).
Tablo 1. Holstein erkek sığırlarda kesim ağırlığı, karkas ve ileri-işlem özelliklerine ait tanımlayıcı istatistikler (n=311).

Traits Analyzed	Mean	Standard Deviation	Coefficient of Variation	Minimum	Maximum
Slaughter age (month)	17.59	1.46	8.28	14	20
Slaughter weight (kg)	510.27	75.61	14.77	298.00	720.00
Hot-carcass weight (kg)	273.07	41.00	14.96	163.00	368.00
Hot-carcass dressing (%)	53.57	2.58	4.81	40.39	59.66
Cold-carcass weight (kg)	266.34	39.86	14.93	157.00	359.00
Cold-carcass dressing (%)	52.26	2.80	5.36	39.60	58.74
Chilling loss (%)	0.07	0.02	23.34	0.03	0.15
Bone content (kg)	50.29	6.37	12.66	31.00	67.00
Total meat yield (kg)	207.99	32.97	15.76	118.00	281.00
Mince (kg)	134.26	28.58	21.15	13.50	203.00
Chunk (kg)	20.08	3.31	16.38	10.70	30.00
Mince + chunk yield (kg)	171.36	27.56	15.99	96.60	234.50
Rib (kg)	17.17	2.90	16.84	3.50	24.50
Roast (kg)	3.35	0.76	22.60	1.50	6.00
Sirloin (kg)	2.74	0.64	23.12	1.00	5.00
Cutlet (kg)	8.74	1.62	18.50	5.00	13.00
Striploin (kg)	4.65	0.96	20.57	2.50	8.00
Total valuable cuts yield (kg)*	36.66	6.37	17.30	21.00	54.00
Processing loss (kg)	8.19	1.76	21.71	3.00	15.00

* Valuable cuts yield included rib, roast, sirloin, cutlet, striploin.

Table 2 shows the proportions of total meat, bone, valuable cuts, and processing loss. Total meat yield was 207.99±2.24 kg with the percentage of 77.94±0.12 % in Holstein bull carcasses analyzed. In addition, the mean values for carcass bone content and the trimmed meat percentage (mince + chunk) were determined 19.05±0.09 % and 64.19±0.13 %, respectively. Results indicated that, total yield of valuable retail cuts were 36.66±0.42 kg with the percentage of 13.74±0.06 %. Processing loss percentage was 3.11±0.04 % on the basis of cold carcass weight.

Pearson's correlation coefficients, shown in Table 3, indicated that all three groups of correlations, including low, intermediate and high, existed in the

present study. Results revealed that pre-slaughter weight highly correlated with, as expected, carcass and bone weights (0.95 and 0.81, respectively), mince + chunk (0.95), valuable retail cuts yield (0.81) and total meat yield (0.95) but did not significantly correlate with valuable cuts percentage (P>0.05). Besides, total meat yield correlated with all the traits analyzed, except valuable cuts percentage in different levels of significance. According to the present results, the correlation between valuable cuts percentage and carcass dressing indicated a low correlation (0.15); whereas the correlation between valuable cuts percentage and both mince + chunk percentage (-0.49) and valuable cuts yield (0.52) exhibited an intermediate correlation. The means of slaughter weight, carcass traits and further-processing characteristics for different age groups are presented in Table 4. Results indicated that the mentioned traits were highly influenced by the slaughter age (P<0.001), except for hot and cold carcass dressings and the percentage of valuable cuts.

Table 2. Descriptive statistics for proportions of retail cuts obtained from Holstein bull carcasses in further-processing (n=311).
Tablo 2. Holstein erkek sığırların ileri-işlemdeki karkaslarından elde edilen perakende parça ağırlık oranlarına ait tanımlayıcı istatistikler (n=311).

Traits Analyzed	Mean	Standard Deviation	Coefficient of Variation	Minimum	Maximum
Meat percentage	77.94	1.76	2.25	71.83	81.72
Bone content percentage	19.05	1.50	7.92	16.28	26.19
Mince + chunk percentage	64.19	2.02	3.14	57.03	70.20
Percentage of valuable cuts*	13.74	1.09	7.98	8.48	16.72
Processing loss percentage	3.11	0.64	20.78	1.13	7.74

* Valuable cuts included rib, roast, sirloin, cutlet, striploin.

DISCUSSION

Assessment of ways to improve profitability and price evaluation have an important role in the economic comparison of breeding strategies on the basis of beef production. Thus, determination of carcass processing traits based on the valuable retail cuts yield may provide a worthy contribution to meat industry. Recently, there is a clear discrepancy between the demand and supply because of the decreasing of domestic beef supply, and hence, the carcass assessment should be maintained to achieve maximum revenue and to evaluate the present situation and future needs in beef industry.

In many countries, beef production may be interpreted as two major categories based on the company structure: companies that produce a combination of dairy or meat products and companies that provide production from specific beef herds (Ardicli et al., 2017). In this context, Turkey's cattle farms generally comprise dairy cattle, dual-purpose breeds or their crossbreds, and the number of specific beef breeds is limited (Anonymous, 2016). Generally, proportions of hind quarter and/or lean meat are higher for beef crosses compared to purebred Holsteins. Thus, crossbreds produces more valuable carcasses (Huuskonen et al., 2013). A number of studies have confirmed a higher share of the most valuable cuts in the carcasses of beef or dual purpose breeds compared to Holstein bulls (Kempster et al., 1982; Barton et al., 2006; Kamieniecki et al., 2009; Pesonen et al., 2013). In the study performed by Pesonen et al. (2013), the means for tenderloin and loin yield were determined 2.2 kg (with the percentage of 1.1 %) and 5.1 kg-5.7 kg (with the percentage of 2.6-3.0 %) in Holstein bulls. These researchers also reported lower carcass bone content (35.4-36.8 kg) and bone percentage (17.3-18.5 %). Kempster et al. (1982) and Manninen et al. (2011) reported a similar share of valuable cuts in Holsteins. In the present paper, evaluation of valuable cuts suggested higher means for sirloin (2.74±0.04 kg) but lower means for striploin (4.65±0.06 kg). By contrast, lower means for loin (3.7–4.3 %), tender loin (1.4-1.6 %) and roast (1.7-2.0 %) were determined by Huuskonen et al. (2013) in purebred Holstein and Holstein x beef breed crossbred bulls including Aberdeen angus, Blonde d'Aquitaine, Charolais, Hereford, Limousin and Simmental. Keane and Allen (1998) and Pabiou et al. (2009) reported higher means for loin and rib proportions in Charolais x Holstein and Irish beef cattle, respectively.

Table 3. Pearson correlations among some values of carcass traits.
Tablo 3. Bazı karkas özelliklerine ait değerler arasındaki Pearson korrelasyonları.

Variables	SW	HCW	HCD	CCW	CCD	CL	BCW	BCP	PL	PLP	MCY	MCP	VCY[a]	VCP[a]	TMY
HCW	0.95***														
HCD	-0.11**	0.21***													
CCW	0.95***	0.99***	0.20***												
CCD	-0.15*	0.14*	0.90***	0.14*											
CL	0.63***	0.70***	0.28***	0.68***	0.20***										
BCW	0.81***	0.88***	0.26***	0.87***	0.23***	0.74***									
BCP	-0.53***	-0.52***	0.01	-0.53***	-0.02	-0.25***	-0.07								
PL	0.48***	0.51***	0.22***	0.50***	0.19**	0.54***	0.65***	0.09							
PLP	-0.24***	-0.22***	0.05	-0.23***	0.03	0.03	0.03	0.56***	0.70***						
MCY	0.95***	0.98***	0.10	0.98***	0.09	0.72***	0.81***	-0.62***	0.47***	-0.26***					
MCP	0.44***	0.36***	-0.27***	0.37***	-0.21***	0.14*	0.01	-0.81***	-0.22***	-0.60***	0.53***				
VCY	0.81***	0.87***	0.21***	0.87***	0.19**	0.65***	0.77***	-0.46***	0.48***	-0.16**	0.82***	0.09			
VCP	0.01	0.06	0.15**	0.06	0.14*	-0.01	0.03	-0.05	-0.01	-0.04	-0.04	-0,49***	0.52***		
TMY	0.95***	0.99***	0.13*	0.99***	0.12*	0.73***	0.83***	-0.61***	0.49***	-0.25***	0.99***	0.46***	0.88***	0.06	
TMP	0.51***	0.45***	-0.22***	0.46***	-0.16**	-0.16**	0.03	-0.96***	-0.26***	-0.72***	0.58***	0.84***	0.43***	0.05	0.56***

Slaughter weight (SW); Hot carcass weight (HCW); Hot carcass dressing (HCD); Cold carcass weight (CCW); Cold carcass dressing (CCD); Chilling loss (CL); Bone content weight (BCW); Bone content percentage (BCP); Processing loss (PL); Processing loss percentage (PLP); Mince + chunk yield (MCY); Mince + chunk percentage (MCP); Valuable cuts yield (VCY); Valuable cuts yield percentage (VCP); Total meat yield (TMY); Total meat percentage (TMP).
* $P<0.05$; ** $P<0.01$; *** $P<0.001$
[a]Valuable cuts yield included rib, roast, sirloin, cutlet, striploin.

Table 4. Comparison of slaughter weight, carcass traits and further-processing characteristics for different age groups in Holstein bulls (n=311).
Tablo 4. Holstein erkek sığırlarda kesim ağırlığı, karkas ve ileri-işlem özelliklerinin farklı yaş gruplarında karşılaştırılması (n=311).

Traits Analyzed	Age Groups			Significance
	14-16 months	17-18 months	19-20 months	
Slaughter weight (kg)	426.62±6.31^{c}	508.54±4.20^{b}	584.51±5.56^{a}	*P*<0.001
Hot-carcass weight (kg)	228.41±3.54^{c}	272.64±2.35^{b}	311.58±3.12^{a}	*P*<0.001
Hot-carcass dressing (%)	53.54±0.32	53.65±0.21	53.35±0.28	NS
Cold-carcass weight (kg)	222.46±3.43^{c}	265.79±2.29^{b}	303.45±3.03^{a}	*P*<0.001
Cold-carcass dressing (%)	52.46±0.35	52.31±0.23	51.96±0.30	NS
Chilling loss (%)	0.06±0.01^{c}	0.07±0.01^{b}	0.08±0.02^{a}	*P*<0.001
Bone content (kg)	44.65±0.64^{c}	50.05±0.43^{b}	55.34±0.56^{a}	*P*<0.001
Bone content percentage (%)	20.03±0.17^{a}	18.93±0.11^{b}	18.24±0.15^{c}	*P*<0.001
Total meat yield (kg)	172.14±2.88^{c}	208.43±1.93^{b}	238.94±2.53^{a}	*P*<0.001
Meat percentage (%)	76.73± 0.19^{c}	78.19±0.13^{b}	78.80±0.18^{a}	*P*<0.001
Mince (kg)	111.24±2.93^{c}	133.35±1.96^{b}	156.84±2.59^{a}	*P*<0.001
Chunk (kg)	17.04±0.33^{c}	20.15±0.22^{b}	22.68±0.29^{a}	*P*<0.001
Mince + chunk yield (kg)	141.58±2.42^{c}	171.66±1.62^{b}	197.27±2.12^{a}	*P*<0.001
Mince + chunk percentage (%)	63.09±0.24^{c}	64.41±0.16^{b}	65.06±0.21^{a}	*P*<0.001
Rib (kg)	14.63±0.30^{c}	17.29±0.20^{b}	19.15±0.27^{a}	*P*<0.001
Roast (kg)	2.66±0.08^{c}	3.36±0.06^{b}	3.94±0.07^{a}	*P*<0.001
Sirloin (kg)	2.28±0.07^{c}	2.73±0.05^{b}	3.16±0.06^{a}	*P*<0.001
Cutlet (kg)	7.23±0.16^{c}	8.69±0.11^{b}	10.09±0.14^{a}	*P*<0.001
Striploin (kg)	3.75±0.09^{c}	4.66±0.07^{b}	5.37±0.08^{a}	*P*<0.001
Total valuable cuts yield (kg)*	30.56±0.63^{c}	36.77±0.42^{b}	41.71±0.55^{a}	*P*<0.001
Percentage of valuable cuts*	13.64±0.14	13.79±0.09	13.74±0.12	NS
Processing loss (kg)	7.60±0.21^{b}	7.86±0.14^{b}	9.02±0.18^{a}	*P*<0.001
Processing loss percentage (%)	3.41±0.08^{a}	2.97±0.05^{b}	2.97±0.07^{b}	*P*<0.001

^{a,b,c} Different superscripts within a row indicate significant difference.
Not significant (NS) *P*>0.05
* Valuable cuts yield included rib, roast, sirloin, cutlet, striploin.

Pre-slaughter weight and carcass characteristics of beef cattle and correlations among them may vary according to the age, genetic background and sex of the animal, nutritional properties and environmental effects (Dannenberger et al., 2006). In this study, as expected, statistically significant differences in carcass characteristics were observed for different slaughter age groups. In this context, age group 19-20 months had higher means for all traits, except for hot and cold carcass dressings, the percentages of bone content, valuable cuts, and processing loss compared to other age groups (14-16 and 17-18 months). Slaughter weight was highly or intermediately correlated with all variables, except valuable retail cuts percentage. The same trend in correlation was also found in hot and cold carcass weights. The results for correlation structure were in accordance with results reported by Choy et al. (2010). It has been assumed that, carcass weight is one of the most important predictors to evaluate the yields and percentages of retail cuts of the carcasses (Chen et al., 2007; Choy et al., 2010; Cicek et al., 2016). According to the present results, there was a consistency in terms of correlation with the mentioned traits and valuable retail cuts yield. In this context, valuable retail cuts percentage significantly correlated with dressing percentages, even if the coefficients were indicated a low correlation (0.15 and 0.14 for hot and cold carcass dressing, respectively). However, there was no significant correlation between valuable retail cuts percentage and slaughter weight (*P*>0.05). Moreover, this same situation existed for the correlation with carcass weights (for both hot and cold carcass). Similarly, Chen et al. (2007) reported that the percentages of prime retail cuts (divided by chilled whole carcass weight) did not correlate with hot carcass weight. One possible explanation about this lack of a correlation may be associated with fat content of the carcasses. Choy et al. (2010) reported that retail cut percentage was highly correlated with body fat reserves and back fat thickness. On the other hand, Cicek et al. (2016) suggested that, a negative and intermediate correlation (-0.51) was found between hot carcass weight and the percentage of tenderloin, sirloin, rib roast, rump, knuckle, round eye and topside-outside flat (which was expressed as first degree retail cuts: FRC) in Holstein bull carcasses. An appropriate approach to optimum pre-slaughter and carcass weights may reveal beneficial outcomes in profitable beef production, especially considered in the case of dairy-type bulls. Thus, if beef output is to be maintained; carcass weights must increase

(Huuskonen et al., 2013). However, increasing carcass weight would not be desirable when beef carcasses are already adequately fat or over fat at existing-carcass weights (Herva et al., 2009; Herva et al., 2011). Taken together, profitability dynamics are needed to be contemplated in beef production, especially for the countries where the production cost is high, such as Turkey.

Valuable retail cut yield determined in this study was lower than the study performed by Cicek et al. (2016). Furthermore, sirloin weight found in the present study for Holsteins were higher than some earlier reports performed by Alpan (1972) and Akbulut and Tüzemen (1994) but lower than Baspinar et al. (1999), Koc and Akman (2003) and Kizil and Aydogan (2014). In the literature, there are several studies about the evaluation of carcass processing traits and valuable retail cuts in various cattle breeds, raised in Turkey or imported, such as mentioned above. However, the number of experimental animals is often limited when carcass traits of different breed groups are compared (usually not more than dozens of cattle per breed group). There is an apprehension about the representativeness of the mentioned animals compared with remaining animals from the same breed with respect to whether they delineate the whole variation and phenotypic spectrum in their respective populations. In addition, breed comparisons are mainly conducted based on environmental factors, for instance, their specific production conditions or genotypic structure contributions. Hence, further experiments based on large datasets collected from Turkish slaughterhouses are needed to evaluate and criticize the present situation in Tukey's beef sector and to study the potential of Holstein bulls for carcass assessment.

In the present study, evaluation of a relatively large dataset consisted of beef production and carcass traits regarding descriptive aspects were performed within the scope of retail cut yields collected from Holstein carcasses. The carcasses of this cattle, however, are characterized by poorer slaughter and quality parameters compared to beef-specific breeds (Węglarz, 2010); beef derived from Holstein breed is one of the significant sources of Turkish beef supply and bulls / cull cows make up a considerable proportion of the beef market. One possible approach for current situation could be commercial crossing of dairy cows with beef-breed bulls as suggested by many researchers (Grodzki et al., 2006; Węglarz, 2010; Huuskonen et al., 2013). On the other hand, more effective selection programs, especially based on genomic analyses, should be formed. In view of the cattle breed structure in Turkey, dual capacity of Holstein breed may be taken into account to cover the shortage of beef demand.

CONCLUSIONS

The large dataset collected in this study describes well the further processing characteristics and share of valuable cuts of Holstein carcasses marketed in South Marmara Region of Turkey. The present results confirm that admissible results were obtained for Holstein bulls. To improve beef production and to reach a potential of self-sufficient country, Turkey should perform a more effective process of carcass assessment. In addition the potential of Holstein breed in Turkey's beef production should be considered. Thus, results of the current study may be useful and indicative for evaluating the present situation in Turkish beef industry and for future studies on meat production traits in livestock.

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