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Carcass traits of young Simmental bulls and heifers classified according to the EUROP system

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ABSTRACT

The objective of this investigation was to determine the carcass traits (weight and measurements, dressing percentage, cooling loss, shares of separated fat and dissected muscle, fat, bone and tendon tissues as well as shares of beef cuts of different retail categories) of young Simmental bulls (n=13) and heifers (n=13) classified according to EUROP system which were produced as Croatian baby beef destined for Italian market. The classification showed a favorable conformation of both, bulls and heifers with about one third carcasses graded as highest E class. The heifers fatness was less favorable and almost half of carcasses were classified as high fat class (4) and thus less valuable. The heifers over fatness was confirmed by significantly higher amount of trimmed carcass fat and higher share of fat tissue and lower share of muscle than bulls after carcass dissection. The carcasses of both sex classified as most valuable E class had the lowest proportion of muscle which imply a need for a additional improvement of conformation assessment practice. The differences between bulls and heifers in dressing percentage, carcass cooling loss, shares of Milanese cut, bone and tendon tissue as well as shares of cuts of different beef retail categories in the carcass were relatively small.
(Keywords: Simmental cattle, baby-beef, carcass traits, EUROP system)

INTRODUCTION

Croatia has traditionally been the exporter of livestock and beef, with Italy as the most important export destination (*Pankretić*, 1998). The most exported product is the ¨baby beef¨ – meat from carcasses of corn-fattened Simmental cattle at the age of about 12 months. It is generally cut and marketed in the form of ¨Milanese cut¨, consisting of the most valuable carcass parts. Croatian baby beef sells mostly in the region of Toscana where it is very appreciated among consumers and usually used for the preparation of the famous Florentine steak (*Kolega et al*., 2003). The market value of a beef carcass is principally determined by weight, conformation and proportions of lean and fat. Since 2004, the EUROP classification system for beef carcasses evaluation has been introduced in the slaughter plants in Croatia (NN 20/2004). This system determines the carcass conformation (meat deposition) and adiposity (fatness) class by common grading scheme facilitating reasonable financial settlement with the producer and carcass trade on European Union market for comparable prices (*Kallwet* and *Henning*, 1998; *Florek* and *Litwinezuk*, 2002; *Wajda* and *Daszkiewicz*, 2002).

The objective of this investigation was to determine the carcass traits of young Simmental bulls and heifers classified according to EUROP system which were produced as Croatian baby beef destined for Italian market.

MATERIALS AND METHODS

The investigation was conducted on twenty six Simmental cattle (a total of 13 bulls and 13 heifers). The animals were calved over the period Oct.-Dec. 2004 on the family farms in the northwestern part of Croatia and bought at the beginning of May 2005 by¨Baby Beef Breeders Association¨, Gudovec for fattening purposes. The fattening took place at the same farm in the two nearby fattening units under the similar conditions for all animals. The mean weight of bulls at the start of fattening was 294 kg, while that of heifers was 288 kg. They were fed corn grain silage *ad libitum*, complemented with approximately 1 kg of concentrate and 1 kg of hay per animal daily for about 5 months. The mean weight of bulls before slaughter reached 510 kg with average daily gain of 1.4 kg, while that of heifers was 455 kg with 1.1 kg of average daily gain. At the time of slaughter the animals were at the age of about 12 months. The slaughter was carried out in five batches during 6 weeks (September – November, 2005) in the Meat Industry ¨*IMI*¨, Ivanec. This abattoir is approved for export to European Union (Export number: 214, registered 05.05.2004). The animals were transported and slaughtered according to established regulations (NN 20/04, NN 116/05). Hot carcass weight (HCW) was measured without removing the subcutaneous fat and maintaining the kidney and pelvic fat. The tail was removed. Dressing percentage (DP) was calculated with formulae: (hot carcass weight / live weight before slaughter) x 100. The excessive covering fat on round and groin area and internal fat depots (kidney and pelvic fat) from right side were trimmed and weighed together to obtain the average value of separated fat (SFAT). Once the dressing was finished, the classification according to the EUROP system was performed on hot carcasses by authorized classifier (Agroinspekt d.o.o.). The classification included the determination of carcass conformation (CONF, expressed as E-excellent, U-very good, R-good, O-fair or P-poor) and carcass fatness (FAT, fat cover expressed as 1-very low fat, 2-low fat, 3-average fat, 4-high fat or 5-very high fat). Several carcass measurements were taken on the right half by meter: carcass length (CL, measured from the anterior edge of symphysis pubis to the anterior edge of the first rib), length of hind leg (LL, measured from the middle of knee joint in the straight line to the anterior edge of the symphysis pubis) or by tape: perimeter of leg (PL, measured as maximum horizontal contour of a leg at the symphysis pubis level). After cooling for 48 hours at 4 °C, the carcasses were weighed once more to determine the cold carcass weight (CCW). Carcass cooling loss (CCL) was calculated with formulae: (HCW-CCW)/HCWx100. The carcass tissue composition was assessed by full dissection of right half of each carcass. The halves were first divided into the quarters by cut between eighth and ninth rib and then into the parts according to scheme in *Figure 1* (DLG method, *Scheper* and *Scholz*, 1985). Each joint was weighed and dissected into the muscle (M), bone (B), fat (F) and tendon (T). The total weight of separated tissues was used as the denominator for calculating proportions of particular tissue in the carcass. The evaluation of ¨Milanese cut¨ (MC, as % of HCW) included hind shank, leg, back and tender loin. Finally, the proportions of beef cuts of different retail categories (*Figure 1*) in the carcass were evaluated. The data were analyzed by analysis of variance using the GLM procedure (*SAS*, 1999).

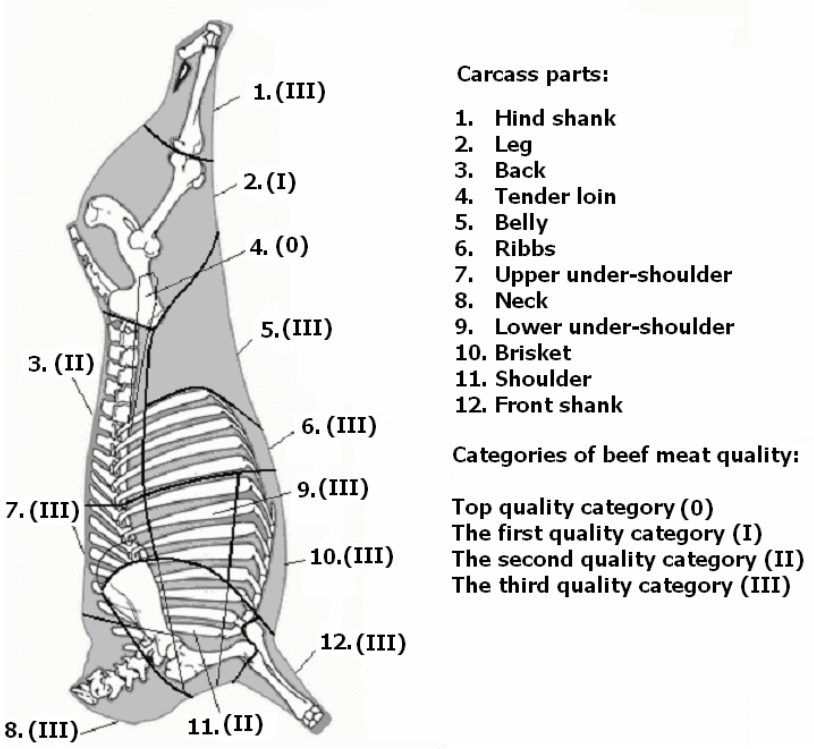
RESULTS AND DISCUSSION

The carcass traits of both sex categories within the EUROP conformation and fatness classes are presented in *Table 1* and *Table 2*. As regards conformation (*Table 1*), the

distribution of the carcasses of bulls and heifers within classes were equally favorable. More than a half of carcasses (7 or 54% in each category) were classified as class U, 30.8% carcasses (4 in each category) were classified as class E and the two carcass per both sex categories were in the class R (15.4%). The carcass fatness assessment (*Table 2*) showed that the carcasses obtained from bulls were mostly average (10 or 76.9% in class 3) and low fat (3 or 23.1% in class 2) whereas the carcasses of heifers were characterized by clearly higher fat deposition (7 or 53.8% in class 3 and 6 or 46.2% in class 4). This findings, although limited due to small number of graded animals, were in accordance to fatness class distribution pattern for bulls and heifers reported by *Žgur* and *Drobnič* (1998) and *Florek* and *Litwinczuk* (2002).

Figure 1

Carcass cuts and corresponding beef retail categories



The carcass weight did not follow consistently the conformation grades (*Table 1*). The highest mean value of HCW was recorded in the class U for the bulls (296.5 kg) while in the same conformation class the mean HCW of heifers was the lowest (252 kg). As regarding to the carcass fatness (*Table 2*), the higher fatness class was followed by higher carcass weight for both, bulls and heifers. Dressing percentage was similar for each sex and with an increase in the muscle and fat deposition the carcass dressing percentage increased. The highest mean DP values were for bulls carcasses classified as class E (57.79%) and 3 (57.28%) while that of heifers were in the class E (57.71%) and 4 (58.03%).

In general, the amount of covering and internal carcass fat were visibly higher for heifers than for bulls and this difference was clearly showed through a percentage of separated fat. The mean value of SFAT in the most frequent conformation class U (*Table 1*) was significantly higher ($P<0.05$) for heifers (5.73%) than for bulls (4.14%). Similar distinction in SFAT percentage between sexes was also found in the most representative fatness class 3 (*Table 2*; heifers - 5.45% and bulls - 4.41%). However, the difference was statistically non-significant. The SFAT percentage increased correctly with higher fatness class and better conformation grade, as conformation includes the visual assessment of the thickness of both muscle and fat depots in relation to the size of the skeleton (*Kallweit* and *Henning*, 1998). The results for carcass cooling loss were similar for bulls and heifers with decreasing tendency as carcass fatness increase.

As expected, the bulls exhibited longer carcasses and legs, as well as larger perimeters of leg than the heifers, in correspondence to their higher finishing and slaughter weight.

Table 1

Least square means and standard errors (LSM±SE) for carcass traits of young bulls and heifers as related to conformation class of EUROP system

Carcass traits	E U R O P conformation class					
	bulls			heifers		
	E (n=4)	U (n=7)	R (n=2)	E (n=4)	U (n=7)	R (n=2)
HCW (kg)	291.0±12.5^{ab}	295.1±9.5^{a}	276.5±17.7^{ab}	272.5±12.5^{ab}	252.0±9.5^{b}	269.5±17.7^{ab}
DP (%)	57.79±0.82	57.15±0.62	55.25±1.16	57.71±0.82	57.42±0.62	56.22±1.16
SFAT (%)	4.38±0.59^{ab}	4.14±0.44^{a}	2.54±0.83^{ac}	6.48±0.59^{b}	5.73±0.44^{bc}	6.31±0.83^{bc}
CCW (kg)	275.5±10.9^{ab}	279.1±8.2^{a}	260.5±15.4^{ab}	252.8±10.9^{ab}	234.3±8.2^{b}	249.5±15.4^{ab}
CCL(%)	0.89±0.22	1.32±0.17	1.79±0.45	0.77±0.22	1.28±0.17	1.18±0.32
CL (cm)	130.9±1.9	135.0±1.4	132.5±2.6	129.6±1.9	128.8±1.4	133.3±2.6
LL (cm)	40.1±0.9	41.4±0.7	40.0±1.3	39.4±0.9	39.9±0.7	40.0±1.3
PL (cm)	120.8±2.2^{ab}	121.2±1.7^{a}	115.5±3.1^{ab}	114.5±2.2^{ab}	112.9±1.7^{b}	114.3±3.1^{ab}
MC (%)	43.55±0.56	43.21±0.37	42.92±0.65	44.29±0.48	43.71±0.37	43.63±0.65
Tissues:						
M (%)	69.38±0.83^{a}	70.97±0.63^{a}	70.75±1.18^{a}	65.43±0.84^{b}	68.04±0.63^{ab}	67.10±1.18^{ab}
B(%)	16.04±0.39	16.13±0.30	17.64±0.55	15.85±0.39	16.44±0.30	16.37±0.55
F(%)	8.07±0.91^{a}	7.06±0.68^{a}	6.44±1.28^{a}	12.25±0.91^{b}	10.03±0.68^{ab}	9.19±1.28^{ab}
T(%)	6.41±0.55	5.85±0.42	5.14±0.78	6.61±0.55	5.50±0.42	7.34±0.78
Meat Cat.:						
0 (%)	1.95±0.08	2.07±0.06	1.96±0.12	1.95±0.08	2.13±0.06	1.90±0.12
I (%)	30.51±0.43	30.36±0.32	29.74±0.61	30.60±0.43	30.62±0.33	30.01±0.61
II (%)	23.25±0.30^{ab}	23.68±0.22^{a}	23.66±0.42^{ab}	23.17±0.30^{ab}	22.65±0.22^{b}	23.17±0.42^{ab}
III (%)	44.29±0.44	43.89±0.33	44.64±0.62	44.28±0.44	44.60±0.33	44.92±0.62

^{a,b,c} Means with different letter within rows differ significantly at $P<0.05$.

HCW–hot carcass weight, DP–dressing percentage, SFAT–separated fat, CCW–cold carcass weight, CCL–carcass cooling loss, MC–Milanese cut, CL–carcass length, LL–leg length, PL–perimeter of leg, M–muscle, B–bone, F–fat, T–tendon, Meat Cat.–meat category.

The most prominent differences (P<0.05) were found for PL measurements within the conformation class U (*Table 1*) and fatness class 3 (*Table 2*), which were 121.2 and 120.3 cm in bulls and 112.9 and 111.4 cm in heifers, respectively. The better conformation and lower fatness class indicated higher share of ¨Milan cut¨ in both sex categories. The mean MC % in the bull carcasses (*Table 1*) ranged from 42.21 in class R to 43.55 in class E, while in the heifers carcasses percentage of MC were somewhat higher with the range from 43.63% (class R) to 44.29% (class E). As related to fatness classification (*Table 2*), the results for share of MC in the carcasses were: 42.98% in class 3 and 43.47% in class 2 for bulls and 43.67% in class 4 and 44.08% in the class 3.

The carcass tissue composition determined by dissection of the right half of the carcass showed, in general, the higher share of muscle and lower share of fat in the bulls than in the heifers carcasses. The mean values of muscle content (M %) for conformation classes E, U and R (*Table 1*) for bulls were 69.38, 70.97 and 70.75%, respectively. Whereas the corresponding values of M % for heifers were 65.43, 68.04 and 67.10%, respectively. The differences between sexes, however, were not statistically significant, except for the heifers in the class E.

Table 2

Least square means and standard errors (LSM±SE) for carcass traits of young bulls and heifers as related to fatness class of EUROP system

Carcass traits	E U R O P fatness class					
	bulls			heifers		
	2 (n=3)	3 (n=10)	4 (n=0)	2 (n=0)	3 (n=7)	4 (n=6)
HCW (kg)	272.7±12.2^{ab}	296.5±6.7^{a}	-	-	246.6±8.0^{b}	277.8±8.6^{ab}
DP (%)	56.31±0.94	57.28±0.52	-	-	56.72±0.62	58.03±0.67
SFAT (%)	2.49±0.55^{a}	4.41±0.30^{b}	-	-	5.45±0.36^{b}	6.75±0.39^{c}
CCW (kg)	259.0±10.9^{ab}	280.0±6.0^{a}	-	-	230.3±7.1^{b}	256.3±7.7^{ab}
CCL(%)	1.50±0.35	1.16±0.16	-	-	1.18±0.19	1.02±0.20
CL (cm)	136.7±2.2	132.4±1.2	-	-	129.8±1.4	129.7±1.5
LL (cm)	41.5±1.0	40.6±0.6	-	-	39.4±0.7	40.3±0.7
PL (cm)	120.0±2.4^{a}	120.3±1.3^{a}	-	-	111.4±1.6^{b}	116.2±1.7^{ab}
MC (%)	43.47±0.57	42.98±0.34	-	-	44.08±0.41	43.67±0.40
Tissues:						
M (%)	71.46±1.01^{a}	70.15±0.55^{ab}	-	-	67.85±0.66^{bc}	66.21±0.71^{c}
B(%)	16.24±0.45	16.36±0.25	-	-	16.73±0.30	15.68±0.32
F(%)	6.17±0.93^{a}	7.61±0.51^{ab}	-	-	9.28±0.61^{b}	12.10±65^{c}
T(%)	6.13±0.71	5.85±0.39	-	-	6.14±0.46	6.11±0.50
Meat Cat.:						
0 (%)	2.01±0.09^{ab}	2.02±0.05^{ab}	-	-	2.17±0.06^{a}	1.90±0.06^{b}
I (%)	30.65±0.48	30.21±0.26	-	-	30.73±0.31	30.28±0.34
II (%)	23.20±0.34^{ab}	23.65±0.19^{a}	-	-	22.76±0.2^{b}	23.04±0.24^{ab}
III (%)	44.14±0.50	44.13±0.27	-	-	44.34±0.33	44.79±0.35

^{a,b,c} Means with different letter within rows differ significantly at P<0.05.

HCW–hot carcass weight, DP–dressing percentage, SFAT–separated fat, CCW–cold carcass weight, CCL–carcass cooling loss, MC–Milanese cut, CL–carcass length, LL–leg length, PL–perimeter of leg, M–muscle, B–bone, F–fat, T–tendon, Meat Cat.–meat category.

Unexpectedly, the lowest share of muscle for both, bulls and heifers, was determined in carcasses classified as class E (the highest conformation score). As regards fatness class (*Table 2*), the M % varied more consistently and with the decreasing fatness grade the share of muscle in the carcass clearly increased. The mean M % of bulls in the fatness class 2 (71.46) were significantly higher ($P<0.05$) than in the class 3 (67.85) and class 4 (66.21) for heifers, whereas mean M % of bulls in class 3 (70.15) was significantly higher than M % in the class 4 for heifers. The opposite trend was apparent for carcass fat content which increased with better conformation grade. The mean F % for conformation classes E, U and R (*Table 1*) for bulls were 8.07, 7.06 and 6.44%, whereas the corresponding values of M % for heifers were 12.25, 10.03 and 9.19%, respectively. F % was not significantly different between sex groups, except for the heifers in class E. Expectedly, the F % increased with higher fatness grade (*Table 2*). The mean F % of heifers in the fatness class 4 (12.10%) were significantly higher ($P<0.05$) than in the class 3 (9.28%) for the same gender group and class 3 (7.61%) and class 2 (6.17%) for bulls group. Whereas the mean F % of heifers in class 3 (9.28) was significantly higher ($P<0.05$) than F % in the class 2 for bulls. Regarding bone (B %) and tendon (T %) percentage, no pronounced differences were observed between sexes within EUROP classification grades (*Table 1* and *2*). The mean values of the share of the most valuable beef cut: tender loin or beefsteak (0-category) and leg (I-category) were not significantly different between sexes within the conformation classes (Table 1). As related to fatness classes (*Table 2*), the significant difference between class 3 and class 4 was observed in the per cent of 0-category beef for heifers (2.17% and 1.90%, respectively). The lowered share of most valuable cuts in the heifers carcasses classified as fatness class 4 class was also reported by *Wajda* and *Daszkiewicz* (2002). The mean share of II-category beef in the carcasses classified as U was significantly higher ($P<0.05$) for bulls (23.68%) than for heifers (22.65%). Significant difference in per cent of II-category meat was also determined between bulls and heifers carcasses classified as fatness class 3 (23.65% and 22.76%, respectively). The results for mean share of III-category beef were similar for both, bulls and heifers carcasses.

CONCLUSIONS

The EUROP classification of ¨baby beef¨ carcasses showed a favorable conformation of both, young Simmental bulls and heifers with about one third carcasses graded as highest E class. The heifers fatness classification, however, was less favorable and almost half of heifers carcasses were classified as high fat and thus less valuable. The heifers over fatness was confirmed by high amount of trimmed fat and higher share of fat tissue and lower share of muscle than bulls after carcass dissection. The lowest proportion of muscle in the carcasses classified as most valuable E class imply a need for a additional improvement of assess practice as assessment is performed visually and the accuracy of classification largely depend on classificator experience. The differences between bulls and heifers in dressing percentage, carcass cooling loss, shares of Milanese cut, bone and tendon tissue as well as shares of cuts of different beef retail categories in the carcass were relatively small. This findings, however, need to be confirmed in the further investigations with larger number of ¨baby beef¨ cattle.

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