



The effect of rearing technology on carcass quality of Cika young bulls

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ABSTRACT

Cika cattle is the only Slovenian autochthonous cattle breed. Nowadays, it is mostly reared in the cow-calf systems. The aim of this study was to find out how rearing technology affects carcass and beef quality of slaughtered Cika bulls. This study included 18 young bulls of Cika cattle; 8 bulls were intensively fattened, while 10 young bulls were grazing on the pastures. Data were analysed by Student t-test using PROC TTEST in the statistical package SAS/STAT considering rearing technology. Young bulls reared on pasture until slaughter had lower carcass weights (232.8 kg vs. 291.8 kg), they were older at slaughter (23.54 months vs. 19.99 months) and reached lower net daily gains (330.5 g/day vs. 488.4 g/day) than fattened young Cika bulls. Average conformation score in carcasses of fattened were significantly higher (7.13) compared to grazed bulls (5.20) as well as fatness score was significantly higher in carcasses of fattened (5.38) compared to grazed bulls (3.40). In carcass sides lean meat had largest part, but the difference between fattened (73.07%) and grazed bulls (73.79%) was not significant. Side carcasses of fattened bulls had significantly larger part of fat (8.91%) compared to 5.95% of fat in carcasses of grazed bulls. The lean meat: bones ratio in fattened carcasses was significantly higher (4.52) compared to grazed carcasses (4.08). Grazed bulls had significantly larger lean meat: fat ratio (14.19) compared to fattened bulls (8.30).

(Keywords: cattle, Cika cattle, autochthonous breed, rearing technology, carcass quality)

INTRODUCTION

Cika cattle is the only Slovenian autochthonous cattle breed. In 2009, the population of Cika cattle is numbering 2159 animals (Sector for Identification and Registration at the Ministry for Agriculture, Forests and Food). Breeding goal for Cika cattle is dual purpose breed with the emphasis on milk production. Cika cattle were traditionally kept for milk production. However, to a smaller extent it is still used for milk production in traditional regions of Alpine dairy-farming. Nowadays, Cika is mostly reared in the cow-calf systems for beef production only, which is not in accordance with the breeding goal. Simčič *et al.* (2008) reported of carcass quality traits of all categories of Cika cattle from data collected in the slaughterhouses in years 2005 to 2007. There were no known data about rearing technology and how it affects the carcass and beef quality of Cika cattle. It is well known that rearing technology also affects the consumer's preferences of choosing beef. This preference includes both, the ecological as well as ethological aspects. The aim of this study was to find out how rearing technology (intensive fattening vs. traditional grazing) affects some traits of carcass and beef quality of slaughtered young Cika bulls.

MATERIALS AND METHODS

This study included 18 young bulls of the autochthonous Cika cattle, 8 bulls were intensively fattened at the Educational and Research Animal Husbandry Centre Logatec (ERC) (Slovenia), while 10 young bulls were grazing on the pastures at four breeders throughout Slovenia. Intensively fattened bulls were moved in the ERC from various suckler herds after weaning at the average age of 233.3 days and average body weight 247.8 kg. Fattened bulls were fed with total mix of maize and grass silage and concentrates. For the first year grazed bulls were in suckler herds together with their mothers till weaning. Bulls were housed during the winter period. In the spring they were put on all day grazing with no added concentrates on the pastures in four different places in Slovenia. Fattened bulls at ERC were slaughtered when they achieved subjectively evaluated optimal fatness. Grazed young bulls were traditionally moved to the slaughterhouses when the vegetation period finished. The average slaughter weight of fattened bulls was 543.6 kg, while slaughter weight of grazed bulls was unknown, because breeders did not weigh their bulls prior to the slaughter. Slaughter age was 20.0 months in average of fattened and 23.5 months of grazed bulls. The average daily gain from birth to slaughter calculated from the body weight and slaughter age was 910.6 g/day at fattened young bulls. After the slaughter, hot carcass weight, carcass length and chest depth were recorded. Carcass length was measured as the distance from the front edge of the pelvic symphysis to the middle of front edge of the first rib. Chest depth is the distance from the ventral edge of the spinal canal to the ventral edge of the broken sternum of the fifth rib. Carcass conformation and fatness were scored according to the EUROP system (Čepon *et al.*, 2006). Net daily gain was calculated from hot carcass weight and age at slaughter. Index of conformation was computed as quotient between hot carcass weight and the product of carcass length and chest depth. The pH₄₈ was measured 48 h after slaughter in the *Longissimus dorsi* muscle behind the last rib using a pH-meter equipped with a penetrating electrode. Beef colour was measured as triplicate on the cross section of *Longissimus dorsi* muscle after 30 min of exposure to the air by chromo meter (Minolta CR 300) and expressed as CIE L*a*b* values. After chilling the right carcass side of each carcass was separated into the main carcass tissues (lean meat, fat, tendons, bones). The total weight of separated tissues was used to calculate the proportions of four various tissues in the carcass. Data were analysed by Student t-test using PROC TTEST in the statistical package SAS/STAT (*SAS Institute Inc.*, 2001) considering rearing technology.

RESULTS AND DISCUSSION

Several studies have been reported to characterize carcass traits of young bulls belonging to the some European beef and dual purpose breeds, as well as autochthonous breeds (Alberti *et al.*, 2008). Some of them considered typical production systems for fattening young bulls of autochthonous breeds (Piedrafita *et al.*, 2003; Serra *et al.*, 2004), while others tried to intensively fatten young bulls of autochthonous breeds to show their potential for beef production (Cozzi *et al.*, 2009; Özlütürk *et al.*, 2004). In this study a traditionally grazed vs. intensively fattened autochthonous Cika young bulls were included.

Grazed young bulls (23.54 months, 706 days) were in average significantly older at slaughter compared to intensively fattened bulls (19.99 months; 600 days) (Table 1). In average hot carcass weight of fattened bulls was significantly higher (291.8 kg)

compared to (232.8 kg) carcasses of grazed bulls. Standard deviations of hot carcass weight were large among grazed as well as fattened bulls. In previous study, *Simčič et al.* (2008) investigated carcass traits of 249 Cika bulls in the A category (bulls under 24 months). Young bulls originated from various farms throughout Slovenia and different rearing technologies. Bulls were slaughtered in abattoirs, where data were collected. However, carcass weight was 260.3 kg, which is less than carcass of fattened bulls (291.8 kg) and more than carcasses of grazed bulls (232.8 kg) in this study. The average daily gain as well as dressing percentage was not computed, because the slaughter weight was unknown in the group of grazed bulls. Bulls in the previous study (*Simčič et al.*, 2008) were slaughtered at an average age of 18.6 months and achieved 474.3 g/day net daily gain. The only computed gain in both groups of bulls in this study was net daily gain, which was significantly higher in fattened (488.4 g/day) compare to grazed bulls (330.5 g/day). It should be considered that grazed bulls have not been supplemented with concentrates.

Table 1

**Age at slaughter, hot carcass weight, net daily gain
and conformation and fatness scores of Cika young bulls**

Trait	Fattened bulls (n=8)	Grazed bulls (n=10)	P-values
	$\bar{x} \pm \text{SD}$	$\bar{x} \pm \text{SD}$	
Age at slaughter (months)	19.99 ± 1.69	23.54 ± 0.74	<0.0001
Hot carcass weight (kg)	291.8 ± 39.0	232.8 ± 48.9	0.0136
Net daily gain (g/day)	488.4 ± 65.9	330.5 ± 74.0	0.0002
Conformation (EUROP)*	7.13 ± 1.55	5.20 ± 0.63	0.0025
Fatness (1–15)	5.38 ± 1.41	3.40 ± 1.26	0.0064
Carcass length (cm)	129.3 ± 3.67	127.5 ± 6.32	n.s.
Chest depth (cm)	42.36 ± 1.62	40.77 ± 1.90	n.s.
Index of conformation	53.09 ± 4.75	44.38 ± 6.18	0.0048

* (E+=15, E+=14, E-=13, U+=12, U°=11, U-=10, R+=9, R°=8, R-=7, O+=6, O°=5, O-=4, P+=3, P°=2, P-=1); SD: standard deviation

Very close slaughter age to grazed Cika bulls (706 days) found *Piedrafita et al.* (2003) in Aubrac bulls (723 days) which were grazed and in the end of fattening period were fed with maize silage, hay and concentrates. Salers bulls were at slaughter 582 day old, which is 20 days less than fattened Cika bulls in this study. Salers bulls were fattened with grass and maize silage, and completed with concentrates. Both, Aubrac and Salers breeds in France were originally used for draught and milk production. Nowadays, they produce purebred and crossbreed weaned calves for fattening (*Piedrafita et al.*, 2003).

Cozzi et al. (2009) found that Burlina bulls, a native dual purpose breed in Italy, experimentally fattened, achieved very similar slaughter weight (546.0 kg) and hot carcass weight (290.9 kg) as fattened Cika bulls (543.6 kg, 291.8 kg), respectively. However, Burlina young bulls needed 126 days less fattened period.

Carcass conformation and fatness were scored according to the EUROP system with 15 possible scores (*Čepon et al.*, 2006). The average conformation score in carcasses of fattened bulls were significantly higher (7.13) compared to grazed bulls (5.20) as well as fatness score was significantly higher in carcasses of fattened (5.38)

compared to grazed bulls (3.40). Index of conformation computed from hot carcass weight, carcass length and chest depth were also significantly higher in carcasses of fattened (53.09) compared to grazed bulls (44.38). Grazed bulls had “thinner” carcasses. There were no significant differences in carcass length and chest depth between fattened and grazed bulls (*Table 1*). Carcass sides of fattened bulls were in average longer and deeper than carcass sides of grazed bulls.

Similar average carcass conformation (7.5) scored by EUROP classification have been found at young bulls of the Asturiana de la Montaña small to medium-sized local cattle breed in Spain, compared to fattened Cika bulls (7.13). The average fatness score (5.5) in Pirenaica, the Spanish medium to large-sized local cattle breed, was also similar to fattened Cika bulls (5.38). Young bulls of the Spanish local breeds were fattened at about 5 – 8 months of age with concentrated meal and straw or hay (*Piedrafita et al., 2003*).

In carcass sides lean meat presented the largest part, but the difference between fattened (73.07%) and grazed bulls (73.79%) was not significant. Side carcasses of fattened bulls had significantly larger part of fat (8.91%) compared to 5.95% of fat in carcasses of grazed bulls. However, a larger part of bones (18.20%) and tendons (2.06%) was found in carcasses of grazed bulls compared to fattened bulls (16.22%, 1.80%), respectively (*Table 2*). In this study, the lean meat: bones ratio in fattened carcasses was significantly higher (4.52) compared to grazed carcasses (4.08). However, grazed bulls had significantly larger lean meat: fat ratio (14.19) compared to fattened bulls (8.30).

Alberti et al. (2008) reported of very similar lean meat (72.9%), fat (9.7%), and bones (17.5%) proportion in carcasses of the Spanish local breed Pirenaica compared to fattened Cika bulls (73.07%, 8.91%, 16.22%), respectively. Young bulls of Pirenaica were fattened with concentrated meal and straw or hay.

Similar proportion of lean meat and bones was found also in fattened young bulls of the local breeds in France, Gascone and Salers. Gascone carcasses had 73.9% lean meat and 14.5% bones, while Salers carcasses had 73.4% lean meat and 15.2% bones (*Piedrafita et al., 2003*).

Table 2

Carcass composition and proportions of Cika young bulls

Carcass composition	Fattened bulls (n=8)	Grazed bulls (n=10)	P-values
	$\bar{x} \pm SD$	$\bar{x} \pm SD$	
Lean meat (%)	73.07 ± 1.03	73.79±2.15	n.s.
Fat (%)	8.91 ± 1.00	5.95±2.07	0.0020
Bones (%)	16.22 ± 0.88	18.20±1.52	0.0050
Tendons (%)	1.80 ± 0.23	2.06±0.16	0.0115
Lean meat:bones ratio	4.52 ± 0.28	4.08±0.40	0.0195
Lean meat:fat ratio	8.30 ± 1.02	14.19±6.03	0.0151

pH and beef colour of *M. longissimus dorsi* are presented in *Table 3*. Differences in pH value and beef colour (CIE L, a, b) of two groups of young bulls were not significant. Even known that beef become darker with age, the older grazed Cika bulls in this study had tendency to have lighter beef than younger fattened ones.

The colour of beef in *M. longissimus dorsi* of Brown young bulls and Black and White young bulls fattened in the similar conditions (ERC) as Cika bulls were reported by *Čepin et al.* (2001). Black and White bulls (L*=36.99, a*=21.33, b*=10.71) as well

as Brown bulls ($L^*=36.69$, $a^*=21.48$, $b^*=10.56$) had lighter and less red beef compared to fattened Cika young bulls.

Table 3

pH value and beef colour of *M. longissimus dorsi* of Cika young bulls

Trait	Fattened bulls (n=8)	Grazed bulls (n=10)	P-values
	$\bar{x} \pm SD$	$\bar{x} \pm SD$	
pH (48 h after slaughter)	5.72±0.09	5.69±0.11	n.s.
CIE L*	36.15±1.89	36.59±1.42	n.s.
CIE a*	25.19±3.47	24.42±1.94	n.s.
CIE b*	12.79±1.91	12.84±1.22	n.s.

CONCLUSIONS

Rearing technology (intensive fattening vs. traditional grazing) significantly affected carcass traits of young bulls of Cika cattle. Young bulls reared on pasture until slaughter had lower carcass weights, they were older at slaughter, reached lower net daily gains and lower conformation and fatness scores. Grazed bulls had in carcasses almost equal proportion of lean meat, lower proportion of fat and higher proportion of bones compared to fattened bulls. There were no significant differences in pH₄₈ and beef colour between grazed and fattened young Cika bulls. Grazed bulls were slaughtered in the end of vegetation period without supplemented with concentrates. It can be recommended to fatten young bulls of Cika cattle after the end of the vegetation period to achieve larger slaughter weights and hot carcass weights, as well as better conformation and fatness scores.

REFERENCES

- Albertí, P., Panea, B., Sañudo, C., Olleta, J.L., Ripoll, G., Ertbjerg, P., Christensen, M., Gigli, S., Failla, S., Concetti, S., Hocquette, J.F., Jailler, R., Rudel, S., Renand, G., Nute, G.R., Richardson, R.I., Williams, J.L. (2008). Live weight, body size and carcass characteristics of young bulls of fifteen European breeds. *Livestock Science*. 114. 19-30.
- Cozzi, G., Brscic, M., Contiero, B., Gottardo, F. (2009). Growth, slaughter performance and feeding behaviour of young bulls belonging to three native cattle breeds raised in the Alps. *Livestock Science*. 125. 308-313.
- Čepin S., Žgur S., Čepon M. (2001). Klavna kakovost naših pasem goved in učinki gospodarskega križanja. *Sodobno Kmetijstvo*. 34. 3. 112-115.
- Čepon, M., Klopčič, M., Potočnik, K., Žgur, S., Dovč, P., Simčič, M., Kompan, D. (2006). Strokovna pravila in opis metod za merjenje in ocenjevanje proizvodnih in drugih lastnosti ter metod za napovedovanje genetskih vrednosti za čistopasemsko plemensko govedo v Sloveniji. Domžale, Univerza v Ljubljani, Biotehniška Fakulteta, Oddelek za Zootehniko, 78 p.
- Özlütürk, A., Tüzemen, N., Yanar, M., Esenbuga, N., Dursun, E. (2004). Fattening performance, carcass traits and meat quality characteristics of calves sired by Charolais, Simmental and Eastern Anatolian Red sires mated to Eastern Anatolian Red dams. *Meat Science*. 67. 463-470.

- Piedrafita, J., Quintanilla, R., Sañudo, C., Olleta, J.L., Campo, M.M., Panea, B., Renand, G., Tutin, F., Jabet, S., Osoro, K., Oliván, M.C., Noval, G., García, P., García, M.D., Oliver, M.A., Gispert, M., Serra, X., Espero, M., García, S., López, M., Izquierdo, M. (2003). Carcass quality of 10 beef cattle breeds of the Southwest of Europe in their typical production systems. *Livestock Production Science*. 82. 1-13.
- SAS Institute Inc. (2001). *The SAS System for Windows, Release 8.02*. SAS Institute Inc., Cary, NC.
- Serra, X., Gil, M., Gispert, M., Guerrero, L., Oliver, M.A., Sañudo, C., Campo, M.M., Panea, B., Olleta, J.L., Quintanilla, R., Piedrafita, J. (2004). Characterisation of young bulls of the Bruna dels Pirineus cattle breed (selected from old Brown Swiss) in relation to carcass, meat quality and biochemical traits. *Meat Science*. 66. 425-436.
- Simčič, M., Čepon, M., Žgur, S. (2008). Carcass quality of autochthonous Cika cattle. *Acta Agriculturae Slovenica*. 92. 2. 103-109.

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