Acta Agraria Kaposváriensis (2010) Vol 14 No 2, 123-127
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Effect of Brown cattle crossing with beef breeds on growth and carcass traits

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ABSTRACT

The aim of the study was to investigate the effect of crossing Brown breed dams with beef breeds sires (Charolais, Limousine and Belgian Blue) on growth and carcass performances of their offspring. Bulls younger than 24 months, bulls older than 24 months and calves slaughtered in Slovenian slaughterhouses from January 2007 to December 2009 were included in the comparison. In all three categories all crossbreds had heavier carcass and better net daily gain than pure breed Brown animals. The highest carcass weight and net daily gain were achieved by Charolais crossbred bulls. On average, the conformation of crossbred bulls was for more than two subclasses better than that of Brown bulls, where the Belgian Blue crossbred bulls reached the best conformation score. Carcass fatness varied from 5.7 to 6.7 (fatness class between 2+ and 3-) among all bulls' genotypes and was the lowest in Belgian Blue crossbreds. Crossbred calves were heavier with better net daily gain and were scored for 2 conformation subclasses better than Brown breed calves. Again the highest net daily gain was achieved by Charolais crossbred calves, whereas the best conformation had Belgian Blue crossbred calves. It is recommended to crossbreed Brown breed dams, which offspring are not planned for replacement, with beef breed sires to improve carcass quality of slaughtered animals.
(Keywords: crossbreeding, brown cattle, beef breeds, carcass traits)

INTRODUCTION

In Slovenia dual purpose Brown breed cattle represents 10% of whole cattle population (*Petrič et al.,* 2009). In the last thirty years this dual purpose breed became more dairy-orientated. Milk yield in standard lactation increased in the last ten years for nearly 900 kg (*Results of dairy ...,* 2009). A possibility to improve carcass traits of Brown cattle animals designed for beef production is to cross dams with beef sires. In Slovenia, the most used beef breeds are Limousine (LIM), Belgian Blue (BB) and Charolais (CHA). The most of crossbred slaughtered animals in Slovenia are represented through crossbreeds between Brown breed and above mentioned beef breeds. The aim of our study was therefore to find out the effect of crossbreeding Brown dams with BB, CHA and LIM sires on growth and carcass performances of their offspring.

MATERIALS AND METHODS

Data were collected from commercial slaughterhouses in Slovenia from January 2007 to December 2009. Data from slaughtered young bulls less than 24 months old (n=13.208), bulls older than 24 months (n=7.082) and calves up to 8 months of age and 185 kg carcass

weight (n=5.424) were taken into the study. Data of altogether 25,714 animals of the following genotypes were processed into statistical analysis: Brown breed (B) and crossbred animals Brown×Belgian blue (B×BB), Brown×Charolais (B×CHA) and Brown×Limousine (B×LIM). Net daily gain was calculated from hot carcass weight and age at slaughter. The conformation and fatness were estimated by independent controllers according to the EUROP classification system with subclasses, where the classes for conformation expressed with letters were transformed to the numbers (E+=15, E0=14,…,P-=1) and classes for fatness as followed 1-=1, 10=2, 1+=3,…, 5+=15. The data of each category were analysed by SAS, GLM procedure (2001). Genotype, year of slaughter and their interaction were included as fixed effects in the model. The differences among different genotypes were tested with CONTRAST statement.

RESULTS AND DISCUSSION

The young bulls represent around 41% of all slaughtered animals in Slovenia (*Žgur et al.,* 2009). The observed growth and carcass performances of young bulls are shown in *Table 1*. At slaughter the young bulls of different genotypes were of similar age. Brown bulls were on average 6.5 days older than the youngest genotype group. Carcass weight of all crossbreeds was significantly greater than that of Brown bulls. Among the crossbreeds the B×CHA bulls had the heaviest carcasses. The carcass weight of B×BB and B×LIM bulls was statistically not different. Similar results were found for net daily gain. In comparison to the Brown bulls, net daily gain of B×BB, B×CHA and B×LIM bulls was greater for 8.1%, 12.1% and 7.2%, respectively. Similar results were found in the study on growth and carcass quality of young bulls of Black and White breed crossed with beef breeds in Slovenia (*Petric et al.,* 2009). Carcass conformation differed among all genotypes being the poorest for Brown bulls, which were on average classified in conformation class O+, and the best for B×BB bulls, which reached on average conformation class between R0 and R+. B×BB bulls were classified for almost 3 subclasses better than Brown bulls. Among the crossbreeds the B×LIM bulls had the poorest conformation, but still for almost two subclasses better then Brown bulls. Carcass fatness varied for almost one subclass between 5.8 (fatness class nearly 2+) and 6.7 (fatness class nearly 3-) among genotypes, being lowest for B×BB and highest for B×LIM bulls. *Kögel et al.* (1989a, b) reported on better carcass quality of crossbred bulls compared to purebred Brown cattle bulls. Results from positive effect of crossing another dual purpose breed (Simmental breed) with beef breeds are also known (*Kögel et al.,* 2000a, b, 2001a, b).

Bulls older than 2 years (old bulls) represent 15% of all slaughtered animals in Slovenia (*Žgur et al.,* 2009) which is 35% of all slaughtered bulls in the last three years. They were slaughtered at age 26.3 months on average (*Table 2*). Slaughter age of B×CHA group differed significantly downwards compared to Brown old bulls, while the slaughter age between other groups varied for a few days and was not significantly different. Carcass weight and net daily gain were significantly different between genotype groups. Brown old bulls had the lowest carcass weight and the lowest net daily gain, while the B×CHA old bulls were the heaviest and reached the best net daily gain. The difference between Brown and B×CHA old bulls was on average 38.3 kg for carcass weight and 54 g/day for net daily gain. Among crossbreds were B×LIM old bulls the lightest, which was the same in the case of young bulls. The conformation differed significantly among genotype groups of old bulls in the same order as in young bulls. The best conformation was valuated for B×BB bulls with the conformation class R+,

following by B×CHA with half of subclass worse conformation and B×LIM with 0.7 subclass worse conformation. The poorest conformation was estimated for Brown old bulls (between O+ and R–), which was for more than 2.6 subclasses worse than in the B×CHA group. The lowest fatness had B×BB old bulls (on average the subclass between 20 and 2+); among other genotypes the difference was not statistically different and for 0.7 subclasses higher fatness as B×BB group (on average the fatness subclass between 2+ and 3–). Old bulls did not exhibited higher fatness than young bulls.

Table 1

The number of bulls under 24 months of age in the genotype groups and their growth and carcass performances (ls mean±SD)

Genotype*	No. of obser-vations	Traits				
		Slaughter age (days)	Carcass weight (kg)	Net daily gain (g/day)	Confor-mation**	Fatness**
B	8456	661.1±0.8^{a}	330.6±0.7^{a}	502±1^{a}	6.30±0.02^{a}	6.47±0.02^{a}
B×BB	1653	656.8±1.9^{b}	357.4±1.5^{b}	547±2^{b}	8.73±0.04^{b}	5.78±0.05^{b}
B×CHA	483	654.6±3.5^{ab}	372.3±2.7^{c}	572±4^{c}	8.41±0.08^{c}	6.34±0.08^{a}
B×LIM	2616	657.3±1.5^{cb}	354.6±1.2^{b}	542±2^{b}	8.15±0.03^{d}	6.67±0.03^{c}

* B: Brown, BB: Belgian Blue, CHA: Charolais, LIM: Limousine; ** EUROP classification scoring: conformation: 15 (E+=best) to 1 (P-=poorest); fatness: 1=1–, leanest to 15=5+, fattest; ^{a,b} values with different superscript among genotypes differ significantly ($P<0.05$).

Table 2

The number of bulls older than 24 months in the genotype groups and their growth and carcass performances (ls mean±SD)

Genotype*	No. of obser-vations	Traits				
		Slaughter age (days)	Carcass weight (kg)	Net daily gain (g/day)	Confor-mation**	Fatness**
B	4799	804.9±0.8^{a}	347.4±0.8^{a}	433±1^{a}	6.34±0.02^{a}	6.44±0.03^{a}
B×BB	762	801.9±1.9^{ab}	376.0±2.1^{b}	470±3^{b}	8.95±0.06^{b}	5.74±0.07^{b}
B×CHA	209	794.8±3.7^{b}	385.7±4.0^{c}	487±5^{c}	8.51±0.12^{c}	6.34±0.12^{a}
B×LIM	1312	804.4±1.5^{a}	369.7±1.6^{d}	461±2^{d}	8.21±0.05^{d}	6.42±0.05^{a}

See Table 1

Animals slaughtered up to 8 months of age are included in the category calves, which represented 18.3% of all slaughtered bovine animals in Slovenia (*Žgur et al.,* 2009). 5424 calves slaughtered in the last three years were included into this study (*Table 3*). On average the slaughter age of all genotype groups was around 4 months, B×CHA calves were slaughtered the youngest but reached the highest net daily gain, and also statistically differed from all other genotype groups' net daily gain. The lowest net daily gain was estimated for Brown calves, 139 g/day less than B×CHA calves, which had also significantly lowest carcass weight. The carcass weight among other genotype

groups varied slightly and was on average around 10 kg higher than that of Brown calves. The best conformation score reached B×BB calves (subclass R0), calves from the groups B×CHA and B×LIM had for half subclasses worse conformation and the Brown calves for 2.3 subclasses worse conformation than B×BB calves. Fatness in all genotype groups was on average estimated around class 2-, compared to other groups the calves from B×LIM group had significantly higher fatness. *Dal Zotto et al.* (2009) reported that crossbreeding with beef bulls increased body weight, price and market value of calves from dairy and dual purpose dams, whereas the crossbreeding with BB bulls increased price and market value of calves much more than LIM.

Table 3

The number of calves in the genotype groups and their growth and carcass performances (ls mean±SD)

Genotype*	No. of obser-vations	Traits				
		Slaughter age (days)	Carcass weight (kg)	Net daily gain (g/day)	Confor-mation**	Fatness**
B	2934	125.8±0.7^{a}	86.8±0.4^{a}	731±4^{a}	5.86±0.03^{a}	4.23±0.03^{a}
B×BB	742	126.7±1.5^{ab}	97.8±0.7^{b}	813±7^{b}	8.23±0.06^{b}	4.30±0.05^{a}
B×CHA	231	116.3±2.6^{c}	96.2±1.3^{bc}	870±13^{c}	7.61±0.11^{c}	4.28±0.09^{a}
B×LIM	1517	123.9±1.0^{b}	95.1±0.5^{c}	810±5^{b}	7.80±0.04^{c}	4.51±0.04^{b}

See Table 1

CONCLUSIONS

In conclusion, crossbred young and old bulls obtained better carcass weight and net daily gain than purebred Brown bulls. Among crossbred bulls the best growth performance showed B×CHA bulls in both age groups. Further, crossbred bulls reached on average for two subclasses better conformation. The best conformation was estimated for B×BB bulls, which had also the lowest fatness. Also crossbred calves slaughtered at around 4 months of age showed better carcass weight and net daily gain. All crossbred genotypes in all age groups showed better growth and carcass quality. From the results we can conclude that crossbreeding with CH improves the most growth traits while the crossbreeding with BB carcass traits.

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