

UDC 637.5`62(497.11)
636.2.061(497.11)
COBISS.SR-ID 250152716
Original research paper



Acta Agriculturae Serbica, Vol. XXII, 43 (2017); 11-21

Effect of age of young simmental bulls on dressing percentage

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Abstract: Considering the Serbia's potential and tradition in production of quality beef meat as food for human consumption and raw material in the food industry and the demand of the EU market, shows the need to intensify the production of this foodstuff. Aim of this paper was to analyze the effect of age of young simmental bulls on dressing percentage in slaughterhouse, according to the standard applied in the EU (Council Regulation (EC) No 1234/2007, Commission Regulation (EC) No 1249/2008; Commission European, Directorate-General for Agriculture and Rural Development). Regulations that define more precisely the quality of meat are only partially implemented in Serbia (Official Gazette of the SFRY 34/74, 26/75, 13/78). The accuracy of the slaughter processing of carcasses is assessed as adequate in the facility in which the analysis was conducted. The study was conducted on 116 young bulls carcasses, from redemption. Two groups of young bulls (cattle) were formed, first group the age of 269-350 days and second group the age of 351-450 days. The results show that due to the wider age intervals in the second group (351-450 days) the difference in mass

of animals before slaughter and carcass weight after primary processing is statistically significant ($P < 0.05$), while the yield difference between the two groups is statistically insignificant ($P > 0.05$). The obtained results indicate that it is necessary to undertake concrete measures in the primary sector to achieve better yield and meat quality.

Key words: age, young bulls, dressing percentage.

Introduction

Global population growth in last few decades increases the food demand, therefore in 2016 according to FAO data (Food Outlook, Biannual Report on Global Food Markets, 2016) 320.7 million tons of meat were produced world wide which is by 0.3% more compared to production in 2015. World production of beef in its scope is in third place, behind pork and poultry meat. In total production poultry participates with 36.23% (116.2 million tons), 36.3% pork (116.4 million tons), beef 21.32% (68.4 million tons) and mutton 4.4% (14.1 million tons). The five largest world producers of beef in 2016 are as follows: United States (11.328 million tons), Brazil (9.620 million tons), EU-28 (7.876 million tons), China (6.801 million tons) and India (2.700 million tonnes) (FAO, 2016). On the other hand, the US (19%), Brazil (15%) and the European Union (13%) produce approximately 47% of global beef production, i.e. less than one-half of the beef in the world.

Globally observed, since 1960 the entire meat production tripled, milk production nearly doubled, and egg production increased four times (Speedy, 2003).

The fact that an increasing number of people live in urban areas and economically developed communities certainly have an impact on increased production and demand of animal origin products (Delgado, 2005).

The average meat consumption per capita in the world in 2016 amounted 43.4 kg per year. It is interesting that the inhabitants of Uruguay consumed beef the most, an average of 124 kg per capita, immediately followed by Argentina with 120 kg and Hong Kong with 114 kg. The United States and Brazil are the 4th and 5th place with 79 kg and 78 kg. However, one should mention the low consumption of meat per capita in two most populous countries: in China meat consumption per capita is 12.2 kg per year and in India only 4 kg per year.

In the EU countries there are significant differences in the beef consumption between the individual Member States. Thus, in 2011 per capita consumption in France was 25.4 kg, 19.7 kg in Slovenia, 17.3 kg in Austria, in Romania it was 6.5 kg while in Bulgaria it was only 4.5 kg (Grgić and Rakić, 2015).

In the past ten years in Republic of Serbia is present continuously negative trend in the total number of cattle with an average annual decline by 2-3% (Petrović *et al.*, 2011). The average rate of decline in the number of cattle in the last three decades was 2.47% and represents the highest rate of decline among all kinds of domestic animals. Number of cattle in 2013 was only 913.000 and it is

the smallest in the period since 1995 to 2013 although a slight increase in 2014 was recorded (Table 1).

Table 1. Trends in the total number of cattle in Serbia 1995-2015 (in 000)

Year	1995	2000	2005	2010	2011	2012	2013	2014	2015
The number of cattle	1354	1246	1079	938	937	921	913	920	916

In registered slaughterhouses in 2015, 302.000 bovines were slaughtered, which is by 45.9% less than in 1995 (658.000 slaughtered animals). Average body weight of cattle is small, 462 to 473 kg in the period from 2013 to 2015, which indicates bad economics of beef production in the Republic of Serbia. According to official statistics in Serbia in 2013, 70.000 tons of beef have been produced, 73.000 tons in 2014 and 77.000 tons in 2015, which is by a tenth of a ton less than in the previous ten years.

Such small production causes small annual consumption of beef per capita, which is bad and has a trend of further reductions. Consumption of fresh beef per capita was 6.1 kg in 2003, 3.6 kg in 2005, 4.5 kg in 2007 and 3.5 kg in 2010 (Zlatanović, 2012).

The Republic of Serbia has lost its status of a major exporter of beef, which had in the mid eighties. Currently, the volume of beef production decreased to such an extent that Serbia does not fulfill a quarter of the expected quota of 8700 kg for beef export to the EU market. Since 2003 when the export was renewed, the largest export was recorded in 2007 (2.289 t) and during all subsequent years did not exceed 2000 t. In order to achieve the export of 8.700 kg of beef, it is necessary to breed 100.000 beef cattle, but in Republic of Serbia there is currently only 15-20.000 fattening bullocks (Paraušić *et al.*, 2010).

The Republic of Serbia used to be exporter of "baby-beef" in Italy and Greece. Beef of superior quality has been exported on Italian market, up to one year of age and body weight of 450 kg for males and 400 kg for heifers, especially appreciated was "baby-beef" meat of high quality heifers. Requirements of Greek market related to the meat of bulls over 500 kg body weight, with the weight of the hull more than 250 kg after slaughter (Aleksić *et al.*, 2012).

However, considering that current production and consumption of beef in the Republic of Serbia is very small, it is not good from an economic point of view since there are natural resources and Simmental breed of cattle with a predisposition for fattening.

In last 20 years, the selection was enacted for the purpose of milk production, but it can be said as well that the production of meat was developed through selection work.

This is best indicated by the fact that young bulls are first tested for growth traits and physical development, and tested to progeny test for milk traits and conformation. However, planned improvement of the meat production requires much clearer definition of breeding objectives. Maternal characteristics, feed conversion ratio, as well as the quantitative and qualitative characteristics of carcass and meat are substantial for meat production (Bogdanović *et al.*, 2005).

Simultaneous selection cattle dual-purpose production on milk traits and meat production demands a combination of different breeding goals and selection methods which differ substantially from the methods that are used in specialized dairy or beef cattle herds (Bittante *et al.*, 1995).

Given the fact that the conditions of beef production are based on most frequent Simmental race, selection meant to improve fattening and slaughter characteristics must also ensure retention of already achieved level of milk production.

One possible way to improve fattening and processing characteristics of domestic spotted cattle is a systematic intersection with beef cattle breeds or obtaining animals for fattening by crossing the domestic cow with lower manufacturing properties with bulls of breeding races such as the French (Charolais, Limousin, Blond Aquitaine), Italian (Piedmontese, Chianina) and of English origin (Aberdeen angus, Shorthorn, Hereford). The aim of this cultivation is the usage of heterosis effect in creating the genotype, which will result in the final body weight in the F1 generation of 550 kg, the average daily weight gain of 1500 g, carcass yield of above 60% and the content of the muscle tissue in the body of more than 65% (Petrović *et al.*, 2007).

On the other hand, the Republic of Serbia is currently in the process of joining the EU member states and it is necessary to make certain amendments to the existing regulations and adopt new ones in order to make meat originating from Serbia competitive on the European market. This will mean that payments to farmers-owners of animals will be conducted according to the achieved quality, not per kg. In order to receive financial compensation for adequate product, manufacturer must recognize the optimal period for slaughter and this should not be dictated by market demand. Manufacturer must know how long it takes for a turnus and which investment can achieve good results.

Materials and methods

The study was conducted on the 116 carcasses of young cattle (young bulls) of domestic Simmental breed, which are divided into two groups according to age. The first group were cattle age from 269 to 350 days ($n = 78$) and the second 351- 450 days ($n = 38$). The aim of this study was to examine the effect of age of young Simmental cattle (young bulls) to yield in a slaughterhouse by following the appropriate criteria. In order to accomplish these objective tasks were set to test the quality of beef cattle (bulls) by monitoring the following parameters (EC No 1234/2007): live animal's

mass, slaughtered weight of the hull, the dressing percentage, accuracy of processing of the slaughter the carcass.

Measuring the weight of the animal prior to slaughter was carried out on the scale with accuracy of ± 0.5 kg, immediately after animals were brought to the slaughterhouse. Measuring the mass of the carcass after slaughter was carried out on the scale with accuracy of ± 0.5 kg, at least 45 minutes after the slaughter.

Carcass weight includes processed carcass without internal organs (with the exception of the kidneys), skin, head, lower parts of legs (separated in the lower part of the carpal, tarsal joints is measured respectively), large blood vessels, spinal cord and the genital organs.

At the end of the processing line, assessment of slaughter processing of hull was performed: hull without internal organs (except kidneys), skin, head, lower parts of the legs (separate in the lower carpal or tarsal joint), large blood vessels, spinal cord and the sexual organs.

After data have been collected, ANOVA procedure was applied for the statistical analysis. Statistical analysis was performed in a statistical package StatsSoft INC (1995).

Results and discussion

Sampling covered 116 cattle (young bulls). In all cases, testing of slaughter correctness showed that processing was assessed as adequate.

Table 2 shows average values in groups and cumulative average values that include several parameters: the weight of live animals, slaughter weight and carcass yield of all 116 beef cattle carcasses that were subject of the study. Cumulative average weight of live animals was 516.23 ± 54.08 kg with a coefficient of variation of 10.47%. The mean value of the slaughter carcass weight was 272.48 ± 27.72 kg and the coefficient of variation was 10.17%. By analyzing the dressing percentage of cattle, it was found that its average was 52.37% and ranged in interval from 39.00 to 63.00%.

Results indicate that due to the wider age interval in the second group (351 to 450 days) difference statistically significant ($P < 0.05$), while the differences between yield of two observed groups were statistically insignificant ($P > 0.05$).

Considering the quality, beef meat is highly appreciated foodstuff in human nutrition. Production and consumption of beef meat has a negative trend in last several years in Serbia and holds third position after pork and poultry (Ostojić *et al.*, 2005; 2006). Domestic demand for beef meat is partially covered by import, because domestic production is not sufficient. Despite good beef production potential and tradition for export, Serbia fails to use its full export potential towards EU market (Aleksić *et al.*, 2007).

In order to improve the current situation it is necessary to enhance and maintain agro-economic policies and strengthen the primary production. Some possible solutions to improve production and quality are improving the quality of breeding

material, nutrition and cultivation technology (Aleksić *et al.*, 2011). Development of production, quality and placement of this type of meat requires improvement to the quality of meat in carcasses, which refers to the contribution of edible parts, carcass conformation and the carcass fat coverage, then processing quality and sensory properties (Sretenović *et al.*, 2011; Ostojić-Andrić *et al.*, 2012).

Table 2. Phenotypic manifestation and variability of dressing characteristics of young Simmental bulls depending on the age at slaughter

Age groups (days)	Characteristics	N	\bar{x}	$S_{\bar{x}}$	SD	CV (%)	Interval variations		F_{exp}
							Min.	Max.	
269-330	Weight before slaughter (WBS)	78	508.89	5.05	44.60	8.76	388.00	613.00	$F_{WBS}=*$
	Carcass mass (CM)	78	268.83	2.76	24.42	9.08	205.00	325.00	
	Dressing percentage (DP) (%)	78	52.41	0.32	2.83	5.39	39.00	63.00	
331-450	Weight before slaughter (WBS)	38	531.32	11.01	67.85	12.77	417.00	713.00	$F_{CM}=*$ $F_{DP}=ns$
	Carcass mass (CM)	38	279.97	5.29	32.60	11.64	206.00	342.00	
	Dressing percentage (DP) (%)	38	52.29	0.50	3.07	5.87	42.00	57.00	
Average (269-450 days)	Weight before slaughter (WBS)	116	516.23	5.02	54.08	10.47	388.00	713.00	
	Carcass mass (CM)	116	272.48	2.57	27.72	10.17	205.00	342.00	
	Dressing percentage (DP) (%)	116	52.37	0.27	2.90	5.53	39.00	63.00	

ns - $P > 0.05$; * - $P < 0.05$; ** - $P < 0.01$; *** - $P < 0.001$;

Carcasses meat rating has immeasurable importance as it allows payment based on achieved meat quality and therefore makes stimulus to producers in the primary sector to improve the process of rearing cattle for slaughter. Unfortunately regulations defining more precisely the quality of meat (Official Gazette of the SFRY 34/74, 26/75, 13/78), are only partially implemented in Serbia, because meat

is classified based on the age of slaughtered animals, live weight and on the categories of meat (outside the category, I category, II category, III category).

In developed countries, the achieved quality of slaughtered animals and the quality of meat in carcasses is taken into account as basis for payment of slaughtered animals. In EU countries, SEUROP classification system (Council Regulation (EC) No 1234/2007, Commission Regulation (EC) No 1249/2008; Commission European, Directorate-General for Agriculture and Rural Development) enables prediction of the meat amount in the carcass, which is the basis for determining the selling price of cattle. Member states are obliged to implement the classification in all slaughterhouses that slaughter more than 75 animals a week, at the annual average. An important segment is the selection of staff to implement classification and must have adequate education and training.

SEUROP evaluating system for carcasses quality is conceptually designed to provide a uniform approach to the assessment of the meat quality. Given that the payment is based on the achieved quality, it provides an incentive to improve the technology of breeding cattle. Serbia is a candidate for EU membership and to achieve that, it will have to implement adopted rules and regulations for quality assessment.

The average weight of cattle prior to slaughter was 516.23 ± 54.08 kg, while the average slaughter weight of the carcass was 272.48 ± 27.72 kg. The average dressing percentage was 52.37% and ranged from 39.00% to 63.00%. Petrović *et al.* (2016) have examined the final weight of young Simmental bulls from purchase on yield and its dependence upon the final weight of the two groups of young bulls. Their results show that the average weight of the first group of cattle was 478.40 kg, the second group 569.42 kg, while the average slaughter weight of the hull of the first group was 250.4 kg and 298.3 kg of another group. The average slaughter weight of the hull in the first group was 250.43 kg and 298.29 kg in the second. Average slaughtering yield was $51.87\% \pm 2.38$ (total for the group 1 and group 2), and ranged from 42.00% to 57.00%.

Kögel *et al.* (1995) found that the crossbreds of Simmental with French fattening Charolais, Limousine and Blonde Aquitaine had better slaughter value of purebred Simmental: higher yield, better carcass conformation, a larger share of muscle, a smaller proportion of fat tissue and bones in the carcass. According to research of Aleksić *et al.* (2002) the mean value of the test results of the slaughter male cattle Domestic Simmental (DSG) and crossbreds domestic Simmental and Limousine (MDL) was successively: weight of the animals prior to slaughter 592.7 kg (DSG) and 589.8 kg (MDL); hot half with fat 329.9 kg (DSG) and 352.7 kg (MDL); dressing percentage 55.66% (DSG) and 59.79% (MDL). Based on the results, authors conclude that domestic Simmental cattle crossed with Limousine breed achieved higher dressing percentage by 4.55% as compared to young cattle of domestic Simmental breed. The authors emphasize that in young domestic Simmental cattle, skin participation in percentages is increased by 1.6% in relation to domestic Simmental crossed with Limousine.

Also mass of slices obtained from diaphragm is higher by 0.09% at domestic Simmental beef. The total mass of the internal organs of domestic Simmental breed bull calves is increased by 0.36%.

In Serbia several studies have been conducted about the effect of genetic improvement on fattening and carcass characteristics of domestic spotted cattle breed that is crossbred with French beef cattle breeds (Charolais, Limousine). Mišćević *et al.* (1999) found that this kind of crossbreeds achieve positive results regarding the body development, conformations of carcass, an increase in yield and quality of the meat. The effect of genotype was more pronounced in terms of slaughter characteristics. In crossbred, dressing percentage was higher by 2.7 4.1% and the ratio of meat/bone indicates that heifers of new genotype have higher percentage of meat.

Obtained data lead to conclusion that improvements are necessary in the field of primary production and providing of better meat yield and quality of meat in carcasses.

Conclusion

Based on results and their critical considerations following can be concluded:

- Average weight of live animals in the first group is 516.23 ± 54.08 kg;
- Average the carcasses slaughtered weight is 272.48 ± 27.72 kg;
- Average carcass yield is 52.37% and it ranged from 39.00% to 63.00%;
- Correctness of slaughter processing is adequate in the facility where the carcass assessment was undertaken.

Acknowledgments

This research was supported by the Ministry of Education, Science and Technological Development of the Republic of Serbia, Projects TR 31001.

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UTICAJ STAROSTI MLADIH BIKOVA SIMENTALSKE RASE NA RANDMAN

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Rezime

Posmatrajući potencijal i tradiciju naše zemlje u proizvodnji kvalitetnog govedeg mesa kao namirnice za ishranu ljudi i sirovine za preradu u prehrambenoj industriji s jedne strane, i potreba tržišta EU sa druge strane, neophodno je intenzivirati proizvodnju ove vrste namirnice animalnog porekla. Cilj rada je bio da se analizira uticaj starosti junadi (mladih bikova) simentalske rase na randman, u klanici, prema standardu koji se primenjuje u zemljama Evropske Unije (Council Regulation (EC) No 1234/2007, Commission Regulation (EC) No 1249/2008; Commission European, Directorate-General for Agriculture and Rural Development). U Republici Srbiji se samo delimično primenjuju propisi koji bliže definišu kvalitet mesa (Pravilnik Sl. list SFRJ 34/74, 26/75, 13/78). Ispravnost klanične obrade trupa je ocenjena kao adekvatna u objektu u kome je sprovedena analiza. Ispitivanje je sprovedeno na 116 trupova junadi (mladih bikova) iz otkupa. Formirane su dve grupe junadi (mladih bikova), prva starosti 269-350 dana i druga 351- 450 dana. Rezultati pokazuju da su usled širih starosnih intervala u drugoj grupi (351-450 dana) razlike u masi životinja pre klanja i masi trupova nakon primarne obrade statistički značajne ($P < 0.05$), dok su razlike između randmana dve posmatrane grupe statistički nesigifikantne ($P > 0.05$). Dobijeni rezultati ukazuju da je neophodno preduzeti konkretne mere u primarnom sektoru radi postizanja boljeg prinosa i kvaliteta mesa.

Ključne reči: starost, mladi bikovi, randman.