

# Meat quality of Istrian cattle

Cukon<sup>1</sup>, N., Ž. Cvrtila Fleck<sup>2</sup>, M. Bratulić<sup>3</sup>, L. Kozačinski<sup>2</sup>, B. Njari<sup>2</sup>

professional paper

## Summary

The goal of this work was to determine the beef meat quality of Istrian cattle using the chemical analyses' results for the quality of its meat. Five meat samples of Istrian cattle bull calves were sampled for the needs of chemical analyses at the end of fattening, at 23 months of age on average. The samples were sampled from m. longissimus dorsi (MLD) between the 7th and the 9th rib and laboratory researches included the basic chemical research, collagen and hidroxyproline quantity and fatty acid content of lipids in intramuscular fat in MLD. The obtained results have shown that the meat of Istrian cattle by its basic chemical composition did not differ from the content of meat of Simmental cattle, except in the fact that quantity of intramuscular fat was in average  $0.94 \pm 0.65\%$ , which is almost three times lower than in Simmental cattle. The content of connective tissue in the meat of Istrian cattle is relatively acceptable, where its quantity is in a positive correlation with meat tenderness. The results of fatty acid content of lipids in intramuscular fat in the meat of Istrian cattle have shown a significant quantity of saturated fatty acids (about 60%), which doesn't give this meat a complete nutritional advantage. But, from the point of view of sustainability and quality, because of that and a smaller quantity of polyunsaturated fatty acids ( $2.41 \pm 0.60\%$ ), such meat is less prone to auto oxidative changes in longer storage period or during processing of meat to the assortment of meat products in sausage type. Overall, the obtained results of our research indicate that the meat of Istrian cattle has a favorable quality for culinary preparation. Therefore, breeding and increasing self-sustainability of this breed has the future. Due to the fact that the population of Istrian cattle of almost 40.000 individuals 50 years ago reduced to only about 530 breeders suitable for breeding, most experts emphasize the significance, value and need for that cattle breed to be preserved. Our researches' results agree with it.

**Keywords:** meat quality, Istrian cattle, chemical composition, collagen and hidroxyproline, fatty acid content of lipids.

## Introduction

Meat quality is one basic characteristic of modern production of beef meat. The word quality is derived from Latin word *qualitas*, which has at least two interpretations. The first one is subjective and it is connected with a positive perception, i.e. with a product which is considered to be good and especially valuable. Then we speak about the meat of good quality. An objective interpretation of quality denotes material characteristics of a product (food), which can be described objectively and neutrally and which isn't connected to either positive or negative grade. Then we speak about the quality of meat (Kušec, 2010).

When we speak about the meat of Istrian cattle, it should be emphasized that it used to be a working animal in Istria for centuries, and then it became beef and dairy cattle. A well-known ox "Boškarin" has always been one of the most recognizable symbols of Istria and people treated it as if it were a family member and a principal support.

Physical appearance of Istrian cattle indicates to good nature, stability, perseverance, obedience and modesty. Istrian field workers have developed it as an intelligent and obedient animal, modest with fodder requirements, and thanks to its

help they could cultivate the Istrian soil and produce food for themselves and the cattle.

Due to the fact that the population of Istrian cattle of almost 40.000 individuals (Kovač, 1999) 50 years ago was reduced to only about 530 breeders suitable for breeding (Ivanković et al., 2010), our experts, including Kovač (1999), emphasize the significance, value and need for that cattle breed to be preserved.

Istria County started the project of permanent protection of Istrian cattle through economic evaluation by giving it a new dimension based on a change of the breeding purpose,

<sup>1</sup> Nenad Cukon, M.A., DVM, The Ministry of Agriculture, Fishing and Rural Development, Veterinary Directorate, Veterinary Office Rijeka—branch office Pazin

<sup>2</sup> Željka Cvrtila Fleck, PhD, Assistant Professor; Lidija Kozačinski, PhD, Full Professor; Bela Njari, PhD, Full Professor with Tenure Position; University of Zagreb, Faculty of Veterinary Medicine, Department of Hygiene, Technology and Food Safety, Heinzelova 55, Zagreb

<sup>3</sup> Mario Bratulić, DVM, Puris Pazin, Sv. Petar u šumi

Table 1 Results of chemical composition of MLD meat of Istrian cattle in %

Indicators	1.	2.	3.	4.	5.	MIN.	MAX.	$\bar{x}$	SD
Water	77.49	76.95	76.73	77.00	78.00	76.73	78.00	<b>77.23</b>	0.46
Proteins	21.15	21.48	21.72	20.24	18.85	18.85	21.72	<b>20.69</b>	1.05
Ash	0.93	1.16	1.09	1.12	1.12	0.93	1.16	<b>1.08</b>	0.08
Fat	0.42	0.38	0.45	1.51	1.93	0.38	1.93	<b>0.94</b>	0.65

Table 2 Results of collagen and hydroxyproline content of Istrian cattle meat (MLD) in %

Indicators	1.	2.	3.	4.	5.	$\bar{x}$	SD
Collagen	0.52	0.67	0.70	0.67	0.98	<b>0.71</b>	0.15
Hydroxyproline	0.0656	0.0841	0.0874	0.0832	0.1225	<b>0.0885</b>	0.0181

by which it primarily becomes a beef cattle. It met the requirements of a working cattle breed functionally with its well-developed frame and strength, so it was necessary to direct the current production by selection work in the direction of improving growth, total muscle tissue and favorable conformations and recognizable meat quality (Caput et al., 2009). The production of beef meat has started. Today, it is the product that should be tasted, according to statements of many gourmets.

Considering the increasingly important aspect and contribution to a healthy lifestyle, the basic goal of this paper was to determine the meat quality of Istrian cattle regarding basic indicators of chemical composition and fatty acid content of lipids in intramuscular fat. By using the obtained results of Istrian cattle meat analysis and putting them into correlation with the known data for meat quality of Simmental beef, we will try to indicate to the existing justifiability of breeding for meat intended for culinary use.

### Material and methods

Five meat samples (*m. longissimus dorsi* – MLD) of bull calves, processed at 23 months of age on average, were taken for the needs of our paper. We need to remind that processing bull calves at that age was very rare. The samples were always sampled from the same spot, between

the 7<sup>th</sup> and the 9<sup>th</sup> rib, out of which samples of about 200 grams were taken in dissection procedure. After technological cooling, meat samples in a slaughter facility were taken always by the same person, and then they were delivered in a frozen condition to laboratories for analytical chemistry of the Croatian Veterinary Institute Rijeka and Zagreb, and Croatian National Institute for Public Health. They were also handled with and analyzed by the same person.

Chemical analyses of meat samples were performed in accordance to the Ordinance on the Methods of Analyses and Super-analyses of Meat, Fat and Oil products (Sl. list SFRY 25/1973, taken over by the Official Gazette of the Republic of Croatia No. 53/91) and in accordance with accredited methods of international and Croatian norms.

The obtained results of chemical analyses of Istrian cattle meat samples were put into correlation with the results of chemical analysis of Simmental cattle meat so, based on that, we showed the advantages and disadvantages of the meat of Istrian cattle bull calves.

The research results were processed by the usual methods of descriptive statistics and presented as average value and standard deviation of the analyzed characteristic in samples.

### Results and discussion

It is evident from the obtained results that water content in MLD was in the range from 76.73% to 78.00% at the most, i.e. it was  $77.23 \pm 0.46$  % on average. Protein content ranged between 18.85 % and 21.72 %, where the average content was  $20.69 \pm 1.05$  %. Ash content was from 0.93 % to 1.16 %, on average  $1.08 \pm 0.08$  %. On the other hand, the average content of intramuscular fat in MLD was  $0.94 \pm 0.65$  %, whereas its quantity was from 0.38 % to 1.93 %. The average collagen content in MLD was 0.71 %, whereas the average hydroxyproline content was 0.0885% on average.

The average quantity of saturated fatty acids (SFA) in researched meat samples of Istrian cattle meat was 58.95%, whereas the average quantity of monounsaturated fatty acids (MUFA) was 38.63%. On the other hand, the average quantity of polyunsaturated fatty acids was 2.41%, and the average ratio of polyunsaturated fatty acids (PUFA) in relation to saturated fatty acids (SFA), i.e. PUFA / SFA was  $0.041 \pm 0.053$  %. The average ratio of unsaturated fatty acids in relation to saturated fatty acids was determined as  $58.95 \pm 3.102$  % in comparison to  $41.04 \pm 3.260$  % of the total mass of fatty acids.

Research results of fatty acid content of lipids in Istrian cattle meat (MLD) indicate that a total of 18 fatty acids, saturated (SFA) ones, were determined: capric (C6:0), caprylic (C8:0), caproic (C10:0), lauric (C12:0), myristic (C14:0), palmitic (C16:0), heptadecanoic (C17:0), stearic (C18:0), behenic (C22:0); monounsaturated (MUFA): myristoleic (C14:1), palmitoleic (C16:1), heptadecanoic (C17:1), oleic (C18:1n-9) and vaccenic (C18:1n-7); then polyunsaturated (PUFA): linoleic (C18:2n-6),  $\gamma$ -linolenic (C18:3n-6),  $\alpha$ -linolenic (C18:3n-3) and stearidonic (C18:4n3). In the process, the most represented saturated fatty acids ob-

tained by the research were palmitic (C16:0), which was determined in the quantity from  $28.98 \pm 1.830$  % of the total fatty acid mass, then stearic (C18:0) which was represented in the quantity from  $24.59 \pm 0.975$  % of the total fatty acid mass. The most represented monounsaturated fatty acid was oleic (C18:1n-9) in an average quantity from  $34.97 \pm 2.763$  % of the total fatty acid mass. The most represented polyunsaturated fatty acid of meat (MLD) lipids was linoleic (C18:2n-6) in an average quantity of  $2.01 \pm 0.433$  % of the total fatty acid.

When we speak about the basic chemical composition of MLD, aggregate data of the research by Štoković (2007) on phenotypic and genotypic characteristics of the longest back muscle of Simmental calves in Croatia were used for comparison. The basic reason for that is that the author researched a relatively large population of almost 700 calves of Simmental breed in the period from 1993 to 2005, in an average age of 420 days (about 14 months). Also, a similarity could be found in similar researches by Božić (2001) and the latest by Maurić et al. (2011). Our calves were 23 months old on average, in which process we managed to find only five carcasses which satisfied the same parameters, due to the fact that for understandable reasons of protection and usage of animals their number and the number of slaughters is very low

It is important to emphasize here that average results of our chemical researches of MLD of Istrian cattle for the content of intramuscular fat ( $0.94 \pm 0.65$  %) are almost equal to the results of the research of Istrian cattle meat by Ivanković et al. (2010), who found the average content of intramuscular fat in MLD of Istrian cattle to be  $1.03 \pm 0.15$ %.

When we observe comparative results of chemical composition of

Table 3 **Comparative results of chemical composition of meat (MLD) of Istrian and Simmental cattle breed in %**

Indicators	Istrian cattle (n=5)	Simmental cattle (ŠTOKOVIĆ, 2007.; n=698)
water	$77.23 \pm 0.46$	$75.13 \pm 1.07$
protein	$20.69 \pm 1.05$	$20.63 \pm 1.37$
fat	$0.94 \pm 0.65$	$3.14 \pm 1.60$
ash	$1.08 \pm 0.08$	$1.10 \pm 0.04$

Table 5. **Comparative view of the results of chemical research of fatty acid content of lipids of MLD intramuscular fat of Istrian and Simmental cattle in %**

Fatty acids	Istrian cattle	Simmental cattle (KAROLY et al., 2009.)
<b>SATURATED (SFA)</b>		
C16:0 palmitic	$28.98 \pm 1.830$	$23.49 \pm 1.320$
C18:0 stearic	$24.59 \pm 0.975$	$14.81 \pm 1.380$
<b>MONOUNSATURATED (MUFA)</b>		
C18:1 oleic	$34.97 \pm 2.763$	$39.29 \pm 5.310$
<b>POLYUNSATURATED (PUFA)</b>		
C18:2n-6 linoleic (linolenic)	$2.01 \pm 0.433$	$8.24 \pm 3.510$

Table 6. **Comparative view of the results of chemical research of profiles of fatty acid content of lipids of MLD intramuscular fat of Istrian and Simmental cattle in %**

Fatty acids	Istrian cattle	Simmental cattle (MAURIĆ et al, 2011.)
SATURATED (SFA)	$58.95 \pm 3.10$	$49.10 \pm 0.56$
MONOUNSATURATED (MUFA)	$38.63 \pm 2.65$	$44.38 \pm 0.51$
POLYUNSATURATED (PUFA)	$2.41 \pm 0.60$	$4.59 \pm 0.11$
PUFA / SFA	$0.041 \pm 0.053$	$0.09 \pm 0.003$

meat (MLD) of Istrian and Simmental cattle breed, we should primarily repeat the conclusion by Schön (1968) who lists that, in comparison to other food, the differences of chemical composition of certain kinds of meat are not significant and they mostly apply to quantity of fat. Still, there are differences not only between certain kinds of meat, but also in comparison to the same kind considering the category, housing conditions and feeding, then degree of corpulence, physiological condition of animals and other factors. In the perspective of comparison to other meaty breeds, Simmental cattle are a breed of medium to large frame and good muscularity. As opposed to that, Istrian cattle are of a larger frame, but muscularity is moderately

well developed. Considering the fact that, according to Živković (1986), the content of water is larger in muscles of skinnier animals, we can assume that the difference in water quantity in MLD of Istrian cattle of  $77.23 \pm 0.46$  % averagely, in comparison to water quantity of Simmental cattle from  $75.13 \pm 1.07$  %, appears exactly because of the listed reason.

When we observe the relation between the protein content in MLD of Istrian cattle, which amounts  $20.69 \pm 1.05$  % averagely, then the protein content of Simmental cattle, which amounts  $20.63 \pm 1.37$  % averagely, it is obvious that the values are almost identical. It is the same with the relation of average ash content of  $1.08 \pm 0.08$  % in Istrian cattle toward the

average ash content in the meat of Simmental cattle, which is  $1.10 \pm 0.04$  %.

According to the results of our research, what differentiates the basic chemical composition of MLD of both Istrian and Simmental cattle is the quantity of intramuscular fat. The average quantity of intramuscular fat in MLD was  $0.94 \pm 0.65$  %, whereas it was  $3.14 \pm 1.60$  % averagely according to the results by Štoković (2007), which is almost three times higher quantity of intramuscular fat in MLD in comparison to the average value obtained by our research. The same fact has been confirmed by the data obtained in researches by Ivanković et al. (2010) who reported that the average quantity of intramuscular fat in MLD of Istrian cattle was three times lower ( $1.03 \pm 0.15$ %) in comparison to the average quantity of intramuscular fat obtained by researches on Simmental cattle, i.e.  $3.14 \pm 1.60$  % (Štoković, 2007). This indicator is one of the factors of evaluation of meat quality of Istrian cattle since, as the result of our research, the quantity of intramuscular fat of Istrian cattle is significantly lower in comparison to the data known from professional literature, which relate to the quantity of intramuscular fat of Simmental cattle (Štoković, 2007).

This research also included collagen quantity, that is, hydroxyproline protein quantity in MLD of Istrian cattle. We determined  $0.71 \pm 0.15$  % of collagen averagely in MLD of Istrian cattle and  $0.0885 \pm 0.0181$  % of hydroxyproline. The quantity of connective tissue in muscles of young animals is, according to Živković (1986), relatively higher than in muscles of older animals, and collagen quantity in MLD of cattle decreases from 0.67% for heifers to 0.41% for older cows. We researched the samples of MLD meat of bull calves at the age of 23 months on average. Therefore, in comparison with the

presented data, we can consider the obtained result for connective tissue in muscles of animals of Istrian cattle at the end of the fattening period to be within the limits of expected and relatively favorable.

It is clear from the comparative view of the results of chemical research of fatty acid content of lipids of MLD intramuscular fat of Istrian and Simmental cattle, that in the results of our researches, as well as in the researches by Karoly et al. (2009), the most frequently represented are two saturated fatty acids – palmitic and stearic. But, the quantity of saturated fatty acids in total fatty acid mass of lipids in MLD intramuscular fat of Istrian cattle is significantly higher. The average quantity of palmitic acid in total fatty acid content of lipids in MLD intramuscular fat of Istrian cattle was  $28.98 \pm 1.830$  % on average, whereas it was  $23.49 \pm 1.320$  % in researches of Simmental cattle by Karoly et al (2009). On the other hand, the average quantity of stearic acid in total fatty acid mass of lipids in MLD intramuscular fat of Istrian cattle in our research was  $24.59 \pm 0.975$  %, while the average quantity of stearic acid in total mass of fatty acid content of lipids in intramuscular fat in the research by Karoly et al (2009) was  $14.81 \pm 1.380$  %.

The most frequently represented monounsaturated fatty acid in total mass of fatty acid content of lipids in MLD intramuscular fat was oleic acid, as in our research, so in the research by Karoly et al. (2009), but its average value in our research was lower ( $34.97 \pm 2.763$  %) than in the researched of the cited authors ( $39.29 \pm 5.310$  %). As it comes to the most frequently represented polyunsaturated fatty acid, in our research, as well as in the research by Karoly et al. (2009) it was linoleic (linolenic) fatty acid ( $2.01 \pm 0.433$  %; i.e.  $8.24 \pm 3.510$  %). It is clear from the listed that the average quantity of linoleic fatty

acid in Istrian cattle was four times lower in comparison to the average quantity of linoleic fatty acid in Simmental cattle from the research by Karoly et al. (2009).

In his research of fatty acid content of lipids in pork, Njari (1986) emphasizes that sensory characteristics of meat, especially its taste, largely depend on quantity and composition of fatty tissue, and especially on quantitative comparison of individual fatty acids like the presence of unsaturated ones and especially volatile fatty acids, and he relates it not only to sustainability, but to meat quality as well. The author lists in his research the case of differentiating meat in the sense that the quantity of polyunsaturated fatty acids is taken as a criterion for evaluation of nutritional value. In relation to that, the result of our research should be taken into account, where a significantly lower average quantity of linoleic acid is evident in relation to the result obtained in the research of a fatty acid composition in MLD of Simmental cattle (Karoly et al., 2009). Njari (1986) also lists that along with the increase in the quantity of polyunsaturated fatty acids in phospholipids, the odor and taste of meat intensify during its longer storage or thermal treatment.

Whereas based on the results by Maurić et al. (2011) on the fatty acid content of lipids in MLD of Simmental cattle it could be said that the relation of saturated and unsaturated fatty acids is about equal (approximately 50:50%), we can say for the relation of saturated and unsaturated fatty acids in the fatty acid content of lipids in MLD of Istrian cattle that it is mostly in favor of saturated fatty acids (approximately 60:40%). It is evident from the comparative view that because of the higher content of unsaturated fatty acids, the meat of Simmental cattle is given certain nutritional advantages.

## Fleischqualität vom Rind aus Istrien (Istarsko govedo)

### Zusammenfassung

Das Ziel dieser Arbeit war, die Qualität des Fleisches vom Rind aus Istrien zu bestimmen, wobei die Resultate der chemischen Analysen hinsichtlich Fleischqualität benutzt wurden. Für den Bedarf der chemischen Analysen wurden Musterproben von 5 männlichen Jungstieren des Rindes aus Istrien genommen. Sie waren am Mastende, durchschnittlich 23 Monate alt. Die Musterproben wurden aus m. longissimus dorsi (MLD) zwischen der 7. und 9. Rippe genommen. Die Laboruntersuchungen umfassten die chemische Grunduntersuchung, Kollagenmenge und Hydroxyproline, sowie die fettsäuerliche Zusammensetzung der Lipide des intramuskulären Fettes in MLD. Die bekommenen Resultate zeigten, dass sich das Fleisch vom Rind aus Istrien seiner chemischen Grundzusammensetzung nach von der Zusammensetzung des Fleisches von Simmentalern nicht unterschieden hat, außer dass die Menge des intramuskulären Fettes durchschnittlich  $0,94 \pm 0,65$  % betrug, was fast dreimal so wenig als bei den Simmentalern ist. Das Durchdringen des Fleisches vom Rind aus Istrien mit Bindegewebe ist relativ annehmbar, wobei seine Menge in positiver Korrelation mit Fleischzartheit steht. Die Resultate der fettsäuerlichen Zusammensetzung der Lipide des intramuskulären Fettes vom Rind aus Istrien zeigten eine bemerkbare Menge der gesättigten Fettsäuren (etwa 60 %), was diesem Fleisch nicht gerade einen gesamten nutrizionistischen Vorteil verleiht. Aber aus der Sicht der Erhaltbarkeit und der Qualität, ist dieses Fleisch deshalb und auch wegen einer kleineren Menge der polyungesättigten Fettsäuren ( $2,41 \pm 0,60$  %) weniger den autooxidativen Veränderungen bei längerer Lagerung ausgesetzt, was auch für die Fleischverarbeitung in das Assortiment der Fleischerzeugnisse bzw. Würste gilt. Die gesamten Resultate unserer Untersuchung zeigen, dass das Fleisch vom Rind aus Istrien eine günstige Qualität für die kulinarische Zubereitung hat. Die Zucht und die Selbsterhaltung der Rasse haben somit eine Zukunft. Da die Population des Rindes aus Istrien von fast 40.000 Exemplaren vor 50 Jahren auf nur 530 für die Zucht und Brut geeigneten Einzelwesen sank, zeigen unsere Resultate und die Untersuchungen anderer Fachleute auf die Bedeutung, den Wert und den Bedarf, dass diese Rindrasse erhalten wird.

**Schlüsselwörter:** Fleischqualität, Rind aus Istrien, chemische Zusammensetzung, Kollagen und Hydroxyproline, fettsäuerliche Zusammensetzung der Lipide

## Qualità di carne dei bovini istriani

### Somario

Lo scopo di questo articolo era determinare la qualità di carne dei bovini istriani, usando i risultati delle analisi chimiche che riguardano la qualità della loro carne. Per poter fare le ricerche chimiche sono stati presi 5 campioni dai bovini istriani maschi alla fine di allevamento, nell'età di approssimativamente 23 mesi ciascuno. I campioni sono stati presi dal m. Longissimus dorsi (MLD) tra la 7a e la 9a coscia, e le ricerche in laboratorio hanno incluso la ricerca chimica fondamentale, quantità di collagene e di idrossiprolina, e la composizione di acidi grassi di lipidi del grasso intramuscolare nel MLD. I risultati ottenuti hanno mostrato che la carne del bovino istriano non deviava dalla composizione di carne dei bovini di razza simmentale, salvo il fatto che la quantità del grasso intramuscolare era in media  $0,94 \pm 0,65$  %, che fa quasi tre volte di meno che dal bovino di razza simmentale. Il contenuto del tessuto connettivo nella carne del bovino istriano è relativamente accettabile, e la sua quantità è in correlazione positiva con la tenerezza della carne. I risultati della composizione di acidi grassi nella carne del bovino istriano hanno mostrato una quantità notevole degli acidi grassi saturi (all'incirca 60 %), e questo non è un vantaggio specialmente nutritivo. Per questa ragione, dal punto di vista di sostenibilità e quello di qualità, ma anche per la quantità evidente di grassi acidi saturi ( $2,41 \pm 0,60$ %), la carne è meno suscettibile alle alterazioni autoossidative durante un immagazzinamento prolungato oppure nel caso di lavorazione di carne nell'assortimento di prodotti di carne tipo salsiccia. Tutto sommato, i risultati che abbiamo ottenuto da questa ricerca rivelano che la carne del bovino istriano è di una qualità accettabile per preparazione culinaria, e perciò possiamo concludere che l'allevamento e la crescita di sostenibilità di questa razza hanno un futuro garantito. Grazie al fatto che la popolazione del bovino istriano da quasi 40 000 entità 50 anni fa è stata ridotta ai soli 530 entità adatte all'allevamento riproduttivo, la maggior parte di professionisti – motivati anche dalle nostre ricerche – puntano l'importanza, il valore e la necessità di salvare questa razza di bovini.

**Parole chiave:** qualità di carne, bovino istriano, composizione chimica, collagene e idrossiprolina, composizione di acidi grassi dei lipidi

If we consider the listed data from the point of sustainability, and thus quality, in accordance with statements by Njari (1986), it is necessary to take into consideration the fact that in our research we determined lower quantities of polyunsaturated fatty acids in total fatty acid content of lipids in relation to the results of fatty acid content in Simmental cattle (Maurić et al., 2011), which is the indicator of a lower susceptibility of the meat of Istrian cattle to changes (oxidation) in relation to Simmental cattle.

### Conclusions

Based on the results of our researches and findings, especially by comparing the obtained results of chemical researches with equal identical indicators of Simmental cattle meat quality and as the answer to the question whether the necessary quality level of the Istrian cattle meat is favorable for further development of self-sustainability of the breed, i.e. is there a justified reason to breed Istrian cattle for meat for culinary usage, the following can be concluded:

- The meat of Istrian cattle does not differ by its basic chemical composition from the meat of Simmental cattle in its quality, even though the meat of Istrian cattle contains a significantly lower quantity of intramuscular fat, which can be an advantage or a disadvantage of meat quality considering the culinary preparation of dishes.
- Connective tissue in the meat of Istrian cattle is within the expected, relatively favorable, in which process that quantity is in a positive

correlation with tenderness, i.e. in a negative correlation with toughness of meat.

- Based on its fatty acid content of lipids in intramuscular fat, the meat of Istrian cattle doesn't have some special nutritional advantages in relation to the observed meat of Simmental cattle. But, because of a lower fat content and composition of lipids, the fact is that such meat from the point of sustainability and the total meat quality indicates to a very lower susceptibility to auto oxidative changes at longer storage or during processing meat to the assortment of meat products in sausage type.
- It can also be concluded from the listed above that the meat of Istrian cattle has a favorable quality for the needs of breeding and increasing self-sustainability of the breed. That meat is an already acknowledged and known delicacy and has its justification for culinary preparation and usage on our market, with the remark that the

fattening period is longer in comparison to Simmental cattle.

\* The paper is an excerpt from the master's specialist by Nenad Cukon, M.A.: "Meat quality of Istrian cattle" (Bela Njari, PhD, professor)

## References

**Božić, P.** (2001): Genetske odlike simental-skog goveda u Hrvatskoj za prinos i kemijski sastav mesa. Doktorska disertacija, Veterinarski fakultet Sveučilišta u Zagrebu.

**Caput, P., A. Ivanković, G. Prekalj, G. Šubara, E. Šuran** (2009): Pro.V.I.C. – Promocija i valorizacija istarskog goveda. Tehnička publikacija, Pazin. Str. 17-30, 38-46, 49-52.

**Ivanković, A., P. Caput, G. Prekalj, N. Kelava, M. Konjačić, G. Šubara, E. Šuran** (2010): Odlike istarskog goveda u proizvodnji goveđeg mesa. Stočarstvo 2-4/10, 91-99.

**Karoly, D., M. Đikić, K. Salajpal, V. Čubrić Čurik, I. Jurić** (2009): The fatty acid composition of muscle tissue of simmental baby-beef. Meso Vol. XI/09, No. 3, 170-174.

**Kovač, M.** (1999): Istarsko govedo. Monografija o istarskom govedu, Višnja, Savez uzgajivača istarskog goveda, 24-29.

**Kušec, G.** (2010): Kvaliteta svinjskog mesa u EU i definicija i mjerenja. Poljoprivredni fakultet Osijek. Izvor: prezentacija, internet stranica.

<http://www.hpa.hr/LinkClick.aspx?fileicet=t=YFhPsl8YIm8%3D&tabid=226&language=en-US>

**Maurić, M., K. Starčević, I. Karadjole, P. Božić, V. Sušić, A. Ekert Kabalin, T. Balenović, S. Menčik, I. Štoković** (2011): Udio tkiva, kemijski sastav i profil masnih kiselina trupova junadi simental-ske pasmine (Sveučilište u Zagrebu, Veterinarski fakultet, Zavod za stočarstvo; Centar za reprodukciju u stočarstvu Hrvatske).

**Njari, B.** (1986): Utjecaj spola i kastracije na kakvoću mesa svinja. Doktorska disertacija, Veterinarski fakultet Sveučilišta u Zagrebu.

**Štoković, I.** (2007): Fenotipske i genetske značajke najdužega leđnog mišića simental-ske junadi u Hrvatskoj. Doktorska disertacija, Veterinarski fakultet Sveučilišta u Zagrebu.

**Živković, J.** (1986): Higijena i tehnologija mesa II dio. Udžbenik za studente veterinarske medicine i priručnik za veterinare. Udžbenici Sveučilišta u Zagrebu. Zagreb. Str. 3-8.

Delivered: February 13, 2012

Accepted: March 4, 2012

m



**ISTRIANINA**

**PRODUKT KOMERC d.o.o. PAZIN**



حلال  
halal

**SVJEŽINA I KVALITETA  
DOMAĆEG UZGOJA**



**HACCP**






**Trošti bb, 52000 Pazin**

**tel: 052 688 140, 688 011**