COMPARISON OF MEAT QUALITY OF TENCH AND CARP

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POREĐENJE KVALITETA MESA LINJAKA I ŠARANA

Abstrakt

U poslednje dve godine postoje veliki problemi u plasmanu slatkovodnih riba proizvedenih na našim ribnjacima. Zahvaljujući nekontrolisanom uvozu, došlo je do toga da se na našem tržištu nađe velika količina jeftinih vrsta riba, pre svega Pangasius pangasius iz Vijetnama , čiji je uvoz zabranjen u mnogim razvijenim zemljama, pre svega SAD, Kanadi i većem broju zemalja Evropske Unije. Velprodajna cena šarana je veoma niska, pa je doveden u pitanje opstanak naše ribarske privrede, u čijoj strukturi šaran učestvuje najvećim delom. Stoga je potrebno razmišljati o uvođenju drugih slatkovodnih vrsta koje bi se mogle plasirati na tržište Evropske Unije, što se pre svega odnosi na linjaka. Takođe, treba razmišljati i o organskoj proizvodnji riba i o kreatnju ka ekstenzivnijim metodama gajenja. Neophodno je voditi računa i o nutritivnom kvalitetu mesa jer se od ribarske privrede očekuje proizvod sa niskim sadržajem masti i povoljnim odnosom nezasićenih masnih kiselina, pre svega ω-3 i ω-6 masnih kiselina. Poznat je povoljan uticaj ω-3 polinezasićenih masnih kiselina (PNMK) iz mesa ribe na zdravlje čoveka, kao i da povećana potrošnja ribe utiče na sprečavanje nastanka oboljenja kardiovaskularnog sistema, kao i u prevenciji inflamatornih, autoimunih i malignih oboljenja, dijabetesa i drugih bolesti. Literalni podaci o randmanu dvogodišnjih riba linjaka i šarana su veoma oskudni, dok su dostupne informacije o konzumnim ribama koje su starosti tri i više godina. Kako kvalitet mesa zavisi od starosti jedinke, neophodna su istraživanja i o kvalitetu mesa mlađih kategorija riba. Osim randmana analizirani su i hemijski sastav mesa dvogodišnjeg linjaka i šarana sa akcentom na zastupljenost masnih kiselina i poređenje odnosa ovih vrednosti kod linjaka i šarana. Uzorci dvogodišnjeg linjaka i šarana uzeti su na oglednom ribnjaku "Mošorin". Proizvodnja ovih riba odvijala se u ekstenzivnom sistemu, gde je povećanje organske produkcije vršeno pregorelim govedim i ovčijim

stajnjakom. Ishrana dodatnim hranivima nije vršena. U pripremi objekta i tokom vegetacionog perioda korišćen je hidratni kreč. Analize hemijskog sastava i masnokiselinskog sastava lipida ribe su izvršene u Institutu za higijenu i tehnologiju mesa, Beograd. Analizom morfometrijskih karakteristika ribe utvrđena je dobra kondicija. Randman mesa linjaka povoljniji je od istoga kod šarana što se može objasniti manjom masom digestivnog trakta ove vrste. Razlog za niži procenat proteina kod linjaka i kod šarana nego što je to prikazivano u klasičnoj literaturi je što se radi o mesu dvogodišnjih riba dok se pomenuti literaturni podaci odnose na starije kategorije koje imaju manji sadržaj vode. Veći sadržaj vode kod dvogodišnjih riba doprinosi boljem gastronomskom kvalitetu mesa. Po sadržaju masti meso linjaka je približno vrednostima tolstolobika i amura, iz čega se može zaključiti da je veoma pogodno kao dijetalna hrana za potrebe posebnih zdravstvenih kategorija ljudi. I dvogodišnji šaran ima nizak procenat masti iz čega se može zaključiti da šaran ne spada u masne ribe jer ima niži procenat sadržaja masti od pastrmke. Tehnologija gajenja odnosno vrsta dodatne ishrane je najodgovornija za procenat masti. Odnos nezasićenih masnih kiselina kod linjaka povoljniji je nego kod šarana i pastrmke i u sličnom nivou je sa istim kod morskih vrsta riba. Meso dvogodišnjih riba po svom hemijskom sastavu ima prednost u odnosu na meso riba gajenih u trogodišnjem i višegodišnjem sistemu gajenja. Ekstenzivni sistem ima prednost u kvalitetu mesa ali treba analizirati njegovu ekonomsku opravdanost. Kvalitet mesa linjaka je izuzetnih nutritivnih vrednosti što je razlog za njegovu reintrodukciju i repopulaciju. Meso riba visoke nutritivne vrednosti ima perspektivu kao izvozni artikal u zemlje Evropske Unije i druge razvijene zemlje.

Ključne reči: *linjak, šaran, randman, nezasićene masne kiseline, ekstenzivna proizvodnja*

INTRODUCTION

The placement of freshwater fish produced in our ponds has become a problem in the past two years. The import lobby takes care that in the Serbian market a large amount of cheap fish species, especially *Pangasius pangasius* from Vietnam, forbidden in the U.S. market, in Canada and in a lot of EU countries, can be found (Ćirković et al., 2010). The cost of production is higher than carp sale prices that raises the question of the survival of our fish industry in which carp is the main cultured fish. It is therefore necessary to think about the introduction of other freshwater species that could be exported to the EU market, primarily tench whose production is practically closed in Serbia. Due to its palatable meat and high attractiveness for anglers, the tench is likely to have a great potential in the future, either as a supplementary species for pond aquaculture or for stocking into open waters **(**Ćirković et al., 2009). Also, it is necessary to think about organic production and extensive methods that was recommended at a meeting of Western European and Eastern European countries 1996 in Budapest (Ćirković and Ćirković., 1996). It is necessary to take into account the nutritional quality of meat because fish is one of the best sources of animal protein (Ozogul et al. 2006) and has been widely accepted as a good source of ω-3 polyunsaturated fatty acids (PUFA), such as eicosapentaenoic (EPA) and docosahexaenoic (DHA) acids. These fatty acids appear to play a key role in neural development, functioning of the cardiovascular and immune systems (Lauritzen et al., 2001), besides the prevention of some types of cancer, including colon, breast and

prostate cancer (Connor., 2000), brain aging and Alzheimer disease (Kyle, 1999). This paper analyzed the meat quality of two years-old tench and carp grown in the extensive system using well water (Ćirković et al., 2009).

MATERIALS AND METHODS

Samples of two-years old tench and carp were taken at the experimental pond »Mošorin«. Production of these fish were in extensive systems where the increase of organic production was done by adding burned-out beef and sheep manure. There was no supplemental feeding. In the facility preparations and during the growing season hydrated lime was used (Ćirković et al., 2000). During the meat yield determination, the edible part of each fish was filleted separately. Analysis of meat was carried out from three pooled samples. The chemical composition of fish was determined using standard BAS ISO methods: protein content (N x 6.25) was determined by Kjeldahl, on a Kjeltec Auto 1030 Analyzer (Manual book, Tecator, Sweden), the water content was determined by drying at 103±2°C to constant mass, total fat determined by fat extraction with petroleum ether, using the Soxhlet apparatus, after acid hydrolysis of the sample (EN ISO methods), the ash content was determined by measuring the mass of residue after annealing at 550±25°C (HRN ISO method). The fatty acids composition of the samples was determined after methyl esterification. Analyses were done at the Institute of Hygiene and Meat Technology, Belgrade.

RESULTS AND DISCUSION

Results of the morphometric measurements of analyzed tench and carp are given in tables 1 and 2, and dressing percentage in table 3. Results of chemical composition and content of unsaturated fatty acids in the meat of two-old carp and tench are presented in tables 4 and 5.

Table 1. Morphometric measurements of analyzed tench

L(overall length) (cm)	19.5	18	21.2	17	18	17	17.5	17.5	16.7	17.8
l (body length)	12	11.5	13.5	10.5	11.5	11	11.5	11.2	11	11.8
lc (head length)	4.5	4.5	5	4	4.3	4	4.5	4.2	3.6	4
Width	5.5	4.2	5	4.3	4	3.8	3.8	3.8	4	4.1
m(mass)(g)	116	88	129	66	78	71	70	64	67	77

Table 2. Morphometric measurements of analyzed carp

L (overall length) (cm)	30	28	29.5	26	26
l (body length)	19.2	17	18	15.5	15.5
lc (head length)	8	8.5	8.5	8.2	7.5
Width	10.5	10.7	12	11.2	9.5
m (mass)(g)	577	531	647	490	371

Table 3. Dressing percentage of tench and carp meat

	Tench	Carp
The total weight after evisceration (g)	810,72	2308,32
Fillets (g)	496,71	1318, 83
Dressing percentage (%)	60	50,38

Table 4. The chemical composition of tench and carp meat

Tench	Protein content(%)	Water content (%)	The total lipids (%)	Ash content (%)
1.tench	14,56	82,31	1,06	1,99
2.tench	14,55	82,15	0,92	2,03
3.tench	14,48	82,10	1,20	1,89
1.carp	16,15	80,31	2,82	1,02
2.carp	15,97	80,12	2,47	1,05
3.carp	16,25	80,14	2,62	1,03

Table 5. Fatty acid composition (% of total fatty acids) of tench and carp

Fatty acid	Tench 1	Tench 2	Tench 3	Carp 1	Carp 2	Carp 3
Myristic acid, C14:0	1.22	1.30	1.18	1.16	1.16	1.17
Pentadecylic acid, C15:0	0.91	0.95	0.99	0.55	0.53	0.53
Palmitic acid, C16:0	24.34	24.40	24.18	21.09	20.78	20.89
Palmitoleic acid, C16:1	5.45	5.71	5.81	5.00	5.14	5.00
Margaric acid, C17:0	1.10	1.12	0.95	0.72	0.70	0.72
Stearic acid, C18:0	8.31	8.02	7.94	5.61	5.14	5.61
Oleic acid, C18:1cis-9	17.85	18.43	17.64	32.03	32.92	32.03
Vaccenic acid,C18:1cis-11	4.50	4.64	4.07	4.15	4.27	4.15
Linoleic acid, C18:2, ω-6	8.98	8.82	8.83	13.34	13.84	13.34
Linolenic(GLA)C18:3,ω-6	0	0	0	0.17	0.21	0.17
α-Linolenic, C18:3, ω-3	3.77	4.06	4.11	4.61	4.71	4.61
Arachidic acid, C20:0	0.46	0.44	0.38	0.28	0.23	0.20
Eicosenoic acid, C20:1	0.61	0.66	0.58	1.56	1.51	1.55
Behenic acid, C20:2	0.85	0.86	0.82	0.77	0.75	0.77
Dihomo-gamma-linolenic acid, C20:3, ω-6	0.82	0.86	0.90	0.74	0.66	0.90
Eicosatrienoic acid, C20:3, ω-3	1.63	1.49	1.56	0.87	0.91	0.81
Erucic acid + Arachidonic acid, C22:1+20:4	6.81	6.43	6.51	2.44	2.82	2.23
Eicosapentaenoic acid, C20:5, ω-3	2.62	2.63	3.15	1.11	1.21	1.06
Docosapentaenoic acid, C22:5, ω-3	2.13	2.17	2.64	0.97	1.09	0.90
Docosahexaenoic acid, C22:6, ω-3	7.64	7.01	7.76	2.27	2.71	2.05
SFA	36.34	36.23	35.62	29.43	29.03	28.63
MUFA	28.41	29.44	28.10	43.08	42.69	43.88
PUFA	35.25	34.33	36.28	27.48	28.27	27.48
n-6	17.46	16.97	17.06	17.63	17.74	17.95
n-3	17.79	17.36	19.22	9.85	10.53	9.53
n-3/n-6	1.02	1.02	1.13	0.56	0.59	0.53

Analyzing morphometric characteristics of fish, good body form was found. Dressing percentage of tench was better than the same in carp that can be explained by the smaller mass of the digestive tract of this species (Ćirković et al., 2002). Tench is one of the cyprinid species that grow relatively slowly even when fed with live food and at the optimal temperatures (Wolnicki et all., 2003). The reason for the lower percentage of protein in the tench and carp meat than descried in literature (Marošević, 1982; Ćirković, 2000) is that we used two-year old fish, while the in mentioned literature data were refering to older fish categories that have a lower water content. Higher water content in two-year fish contributes to the higher culinary quality of meat. The fat content of tench meat is similar to that of big head carp and grass carp, and has a bit more fat than frog leg meat (Ćirković, 2000), from which it can be concluded that it is very suitable as dietary food for special health categories of people. Two-year old carp has also a low percentage of fat from which it can be concluded that carp are not concerned to be fatty fish because it has a lower percentage of fat content than trout (Spirić et al., 2009). Production technology and type of additional feeding is most responsible for fat percentage (Steffens and Wirth, 2007). The ratio of unsaturated fatty acids in tench is better than that of carp and trout and is at a similar level as in marine fish species (Kris-Ehterton et al., 2002).

CONCLUSION

The chemical composition of two years-old fish meat has an advantage over the flesh of older (three and four year old). Extensive systems have the advantage regarding meat quality, but it is necessary to analyze its economic feasibility. Meat quality of tench has an exceptional nutritional value being the reason for its reintroduction and repopulation. Fish meat with high nutritive value and low residual activity has a perspective as an export article to the European Union and other developed countries.

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