PROXIMATE COMPOSITION AND CHOLESTEROL CONTENT IN COMERCIAL IMPORTANT FRESHWATER FISH SPECIES IN SERBIA

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HEMIJSKI SASTAV I SADRŽAJ HOLESTEROLA U KOMERCIJALNIM SLATKOVODNIM VRSTAMA RIBA U SRBIJI

Apstrakt

Riba se, pripremljena na različite načine, konzumira u celom svetu, zahvaljujući činjenici da riblje meso sadrži veoma značajne komponente za ishranu ljudi. Riba je bogat izvor visokovrednih proteina, vitamina i esencijalnih minerala, ali iznad svega predsavlja veoma bogat izvor omega-3 i omega-6 polinezasićenih masnih kiselina, koje su veoma značajne za zaštitu zdravlja potrošača.

Holesterol je, takođe, značajan za organizam čoveka. Potrošnja namirnica sa visikom sadržajem holesterola može da ima za posledicu nastajanje brojnih kardiovaskularnih oboljenja.

Cilj ovih ispitivanja je bio da se odredi hemijski sastav i sadržaj holesterola u komercijalnim slatkovodnim vrstama riba (amur, tolstolobik i šaran), gajenim u dva objekta za akvakvakulturu u Srbiji. Sa druge strane, da bi se poredili parametri kvaliteta (proteini, voda, mast, pepeo) i sadržaj holesterola u ribljim vrstama, gajenim u Srbiji sa uvoznim, u poslednje vreme veoma zastupljenim na našem tržištu, uzorci pangasiusa iz Vijetnama takođe su analizirani.

U ovom radu analizirani su uzorci amura, tolstolobika i šarana gajenih u dva ribnjaka sa poluintezivim uzgojem ali različitim načinima ishrane. U prvom ribnjaku riba je hranjena komercijalnom ekstrudiranom hranom, dok su u drugom ribnjaku, kao dodatna hrana prirodnoj, korišćene žitarice. Uzorci pangasiusa iz Vijetnama uzeti su sa tržišta.

Statističkom evaluacijom dobijenih rezultata za hemiski sastav (proteini, voda, mast, pepeo) i sadržaj holesterola u amuru, tolstolobiku i šaranu iz prvog ribnjaka ustanovljeno je da postoji statistički značajna razlika ($p<0,005$) u sadržaju istog parametra kvaliteta kod najmanje dve vrste ribe. Sadržaj holesterola u šaranu se statistički značajno razlikovao ($p<0,005$) u odnosu na sadržaj holesterola u tolstolobiku i amuru, dok ta razlika nije bila statistički značajna ($p>0,005$) između sadržaja holesterola u tolstolobiku i amuru.

U drugom ribnjaku, sa izuzetkom sadržaja proteina, takođe je ustanovljeno da postoji statistički zanačajna razlika ($p<0,005$) u sadržaju istog parametra kvaliteta kod najmanje dve vrste ribe. Statistički značajna razlika u sadržaju holesterola ustanovljna je između tolstolobika i amura.

Dobijeni rezultati ovih istraživanja ukazuju da se amur, u poređenju sa šaranom i tolstolobikom iz oba ribnjaka, može smatrati nutritivno najkvalitetnijom vrstom ribe.

Ispitana riba iz familije ciprinida (šaran, tolstolobik i amur) iz domaće akvakulture ima veći sadržaj proteina u odnosu na pangasiusa iz Vijetnama, tako da ona predstavlja nutritivno kvalitetniju namirnicu u ishrani ljudi.

Ključne reči: *hemijski sastav, sadržaj holesterola, riba iz akvakulture*

INTRODUCTION

Fish is consumed all over the world in various forms, considering the fact that fish meat contains a lot of important nutritional components (Vranic et al., 2010). Accordingly, studies on food composition and its nutritional implication (Ramos Filho et al., 2010) is important as it is known that a high consumption of fish meat has a benefic role on human health (Friesen and Innis, 2009). Fish are a source of high quality proteins, vitamins and essential minerals but, above all, a virtually unique, rich source of omega-3 long-chain poly-unsaturated fatty acids (PUFA). Fish also contains significant amounts of essential amino acids, particularly lysine which is low in other animal tissues. Fish protein can therefore be used to complement the amino acid pattern and the overall protein quality of a mixed diet (FAO, 2005).

Cholesterol is also very important in the human organism. A correlation between serum cholesterol level and mortality rate on the cardiovascular diseases in humans was proved in many studies (Griffin, 1999). Lower consumption of foods with high cholesterol content was the consequence of higher incidence of many cardiovascular diseases.

The aim of this study was to determine proximate composition and cholesterol content in muscle tissue (filet) in three fish species (common carp, silver carp – *Hypophtalmichthys molitrix* and grass carp – *Ctenopharyngodon idella*) reared in two aquaculture fishponds in Serbia. On the other hand, in order to compare chemical composition and cholesterol content of fish species reared in Serbia with some commercial, marketable fish, filets of pangasius imported from Vietnam were analyzed too.

MATERIALS AND METHODS

In this study marketable size common, silver and grass carp from two fish farms (I and II) from Serbia in a semi-intensive rearing system, were analyzed. These semi-intensive fish farms had different feeding regime. In the first fish farm fish was fed commercial extruded diet, while in the second fish farm as supplementary feed only wheat was used. Although all these three fish species belong to the same fish family (Cyprinidae), they were feed different kind of feed. On the other hand, marketable size pangasius imported from Vietnam was analysed too.

Samples were collected from October and November 2010. The collected fish of each category (n=6) were stored at +4°C before being filleted. Fish fillets were homogenized in a laboratory blender (Braun CombiMax 600), separately placed in plastic bags

and stored at -25°C until analyzed. A day before the sample preparation, samples were defrosted overnight, at +4°C.

Analyses of moisture, fat and ash were preformed according to ISO standard procedures (ISO 1973, 1996, 1997, 1998). Protein content (Kjeldahl nitrogen) was determined by using Kjeltec Auto 1030 Analyzer. Cholesterol determination in all samples was performed by using HPLC/PDA system, according to the method described by Maraschiello et al. (1996).

The data were statistically analyzed by using MINITAB Statistical Software (Release 14 for Windows) in order to compare the effect of feed on proximate composition and cholesterol content in the three fish species reared in the same fish pond. This effect was declared significant if $P<0.05$. Analysis of variance (ANOVA) with Tukey's test (95% confidence intervals) was applied.

RESULTS

Chemical composition and cholesterol content in the analysed fish samples are given in Tables 1-3.

Table 1. Chemical composition and cholesterol content in filets of three marketable size carp species from first fish farm (mean ± standard deviation, n=6)

I Fish farm	*Common carp*	*Silver carp*	*Grass carp*
Proteins (%)	$15.92^{a} \pm 0.54$	$18.69^{b} \pm 0.18$	$16.41^{a} \pm 0.13$
Moisture (%)	$75.59^{a} \pm 1.07$	$75.04^{a} \pm 0.15$	$71.22^{b} \pm 0.15$
Fat (%)	$6.99^{a} \pm 0.15$	$4.39^{b} \pm 0.13$	$11.59^{c} \pm 0.35$
Ash (%)	$0.96^{a} \pm 0.07$	$1.16^{b} \pm 0.04$	$0.95^{a} \pm 0.10$
Cholesterol (mg / 100g)	$50.55^{a} \pm 2.73$	$42.27^{b} \pm 1.21$	$40.12^{b} \pm 0.72$
Energy value (kcal /100g)	127.07 ± 1.63	117.40 ± 0.14	168.75 ± 1.99
Energy value (kJ /100g)	531.53 ± 6.66	493.33 ± 0.53	702.78 ± 8.10

Values in the same row followed by the same letters do not differ significantly (p>0.05)

Table 2. Chemical composition and cholesterol content in filets of three marketable size carp species from second fish farm (mean ± standard deviation, n=6)

II Fish farm	*Common carp*	*Silver carp*	*Grass carp*
Proteins (%)	17.41 ± 0.44	17.46 ± 0.43	16.74 ± 0.70
Moisture (%)	$76.14^{a} \pm 2.01$	$74.02^{b} \pm 1.32$	$71.90^{c} \pm 0.15$
Fat (%)	$5.00^{a} \pm 1.56$	$7.44^{b} \pm 1.53$	$8.87^{b} \pm 0.65$
Ash (%)	$1.06^{a} \pm 0.05$	$1.06^{a} \pm 0.04$	$1.79^{b} \pm 0.39$
Cholesterol (mg / 100g)	50.19 ± 10.10	$66.69^{a} \pm 20.60$	$43.82^{b} \pm 5.91$
Energy value (kcal /100g)	115.23 ± 17.47	134.93 ± 11.04	144.42 ± 4.14
Energy value (kJ /100g)	483.49 ± 72.06	564.61 ± 45.62	603.52 ± 16.36

Values in the same row followed by the same letters do not differ significantly (p>0.05)

Table 3. Chemical composition and cholesterol content in filets of marketable size pangasius (mean ± standard deviation, n=6)

Marketable size fish	**Pangasius**
Proteins (%)	11.67 ± 0.09
Moisture (%)	85.78 ± 0.06
Fat (%)	0.94 ± 0.08
Ash (%)	1.36 ± 0.01
Cholesterol (mg / 100g)	47.14 ± 3.31
Energy value (kcal /100g)	56.14 ± 0.71
Energy value (kJ /100g)	237.50 ± 3.03

DISCUSSION

By statistical evaluation of the obtained results for proximate composition (proteins, moisture, fat, ash) and cholesterol content for the three investigated fish species (Common, Silver and Gras carp) from first fish farm (Table 1) it was established that there was a significant difference ($p<0.05$) in the content of the same parameter at least between two fish spaces.

In the second fish farm (Table 2), with exception of protein content, it was observed that there was a significant difference ($p<0.05$) in the content of the same parameter at least between two fish spaces too.

In the first fish farm (Table 1), when comparing the individual parameters, the highest content of proteins contained silver carp followed by grass carp and common carp. Content of fat ranged from 4.39% (silver carp) to 11.59% (Grass carp). In the second fish farm (Table 2), the content of protein was similar for all three species (average value – 17.20%), while the content of fat was 5.00%, 7.44% an 8.87% for common carp, silver carp and grass carp, respectively.

Comparing cholesterol content in the same fish species only in the case of silver carp from the second fish farm higher cholesterol content was determined. The lowest cholesterol content was established in crass carp from both aquacultures rearing systems (40.12% - I Fish farm; 43.82% - II Fish farm). The highest energy value (kcal/100 g) was determined in crass carp (168.75 - I Fish farm; 144.42 - II Fish farm).

Marketable size pangasius contained only 11.67% of proteins followed by 85.75% of moisture and only 0.94% of fat. The calculated energy value was only 56.14 kcal/100 g. These values indicate to low quality fish when comparing with common carp, silver carp and grass carp from the national aquaculture.

CONCLUSIONS

The obtained data indicate that crass carp compared with common carp and silver carp from both fish farms might be considered as most valuable fish.

Marketable size Cyprinidae fish family (common carp, silver carp and grass carp) from domestic aquaculture contain higher value of proteins than pangasius from Vietnam what makes these fish more adequate from nutritional point.

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