EFFECT OF RAPESEED OIL IN FISH FEED ON MEAT QUALITY OF COMMON CARP

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UTICAJ ULJA ULJANE REPICE U RIBLJOJ HRANI NA KVALITET MESA ŠARANA

Apstrakt

Meso šarana, najzastupljenije ribe na ribnjacima u Republici Srbiji, predstavlja značajan nutritivni izvor n-3 visoko nezasićenih masnih kisleina (HUFA), pre svega eikozapentaenske (EPA) i dokozaheksaenske (DHA) kiseline, koje imaju važnu ulogu u bitnim fiziološkim procesima u organizmu i očuvanju zdravlja ljudi. Sadržaj masti i masnokiselinski sastav šarana su pod uticajem pola, godišnjeg doba, reproduktivnog statusa, uslova životne sredine, načina gajenja a posebno načina ishrane. Dobra tehnologija proizvodnje na ribnjaku je od nesumnjivog značaja za odgovarajuću strukturu planktonskih i bentosnih organizama, što igra veliku ulogu u dobijanju mesa šarana što boljeg hemijskog sastava. Riblje ulje je dugo predstavljalo glavni izvor masti u hrani za ribe, ali je zbog sve veće potrošnje, pa samim tim smanjene raspoloživosti i drastičnog povećanja cene istog došlo do povećanja upotrebe ulja biljnog porekla kao potpune ili delimične zamene za riblje ulje u hrani za ribe. Zamena ribljeg ulja sa biljnim uljima može imati i negativnih efekata na ribe iz uzgoja pošto je riblje ulje dobar izvor n-3 HUFA, što nije slučaj kada su u pitanju ulja biljnog porekla koja sadrže visok procenat 18C n-3 masnih kiselina, ali su siromašna ili potpuno lišena n-3 HUFA. Prema dosadašnjim istraživanima šaran ima veće potrebe za n-6, nego za n-3 masnim kisleinama za optimalan rast i razvoj. Uljana repica ima višestruku namenu: za ishranu ljudi, životinja i kao industrijska biljka. Odnos n-6/n-3 u ulju uljane repice je 2:1, što je pogodno sa aspekta zdravlja ljudi; bogato je oleinskom kisleinom i polinezasićenom

masnim kiselinama (PUFA), pogotovo sa linolnom i linoleinskom kiselinom, ali ne poseduje n-3 HUFA. Često se upotrebljava u komercijalnim smešama za ishranu riba, bez negativnog uticaja na proizvodne parametre, ali može imati negativan uticaj na masnokiselinski sastav mesa šarana. Međutim, najveći broj istraživanja o zameni ribljeg ulja uljem uljane repice je izveden na salmonidnim vrtsama riba, pa su poželjna dalja ispitivanja o uticaju ovog ulja na kvalitet mesa i imunološki status šarana. Može se reći da meso šarana uglavnom poseduje povoljan masnokiselinski sastav i svrstati se u zdravu hranu za ljude. Gajenje šarana sa korišćenjem gotovih krmnih smeša bi trebalo da postane praksa na ribnjacima u Srbiji, kako bi se povećala proizvodnja po jedinici površine, dobio šaran što boljeg kvaliteta i postigla dugoročna ekonomska održivost. Takođe, potrebno je vršiti promociju šarana kao nacionalog zdravog proizvoda poželjnog u svakodnevnoj ishrani ljudi. Istraživanja o daljem unapređenju kvaliteta mesa šarana, kao i o načinu ishrane koji će zadovoljiti potrebe ove vrste, ali i ciljeve što ekonomičnije proizvodnje su neophodna u cilju dobijanja što jeftinijeg šarana, koji će zadovoljiti sve potrebe potrošača.

Ključne reči: šaran, ulje uljane repice, masti, masnokiselinski sastav
Keywords: common carp, rapeseed oil, lipids, fatty acid composition

INTRODUCTION

The prices of fishmeal and fish oil (FO) on the global market are increasing continuously rendering the sustainability of their use as fish feed components questionable (Naylor et al., 2000). Neither fishmeal nor fish oil is produced in Serbia, the import of these rises the production expenses, which poses a serious problem to and burdens fish farming; thus it is necessary to provide alternative feed components which will meet the needs of the reared fish, primarly common carp. The replacement of FO with vegetable oil (VO) can thus be rather challenging due to the fact that VOs are devoid of the n-3 HUFA which are abundant in FO including EPA and DHA. This review provides informations regarding the nutritional and feeding value of rapeseed oil, examines the literature on the implications of using rapeseed oil in common carp nutrition, and offers recommendations on future research needs.

COMMON CARP

Common carp is the most widespread fish species in Serbia. It is omnivore fish and very effectively uses food. Carp is tolerant to large variations of quality of ambient conditions, not susceptible to diseases and is tolerant to handling (Ćirković et al., 2010). Alike other fish species, common carp cannot synthesize the essential fatty acids of the n-6 and n-3 series. Hence, these fatty acids must be provided by the feed. Their original food sources are zooplankton, zoobenthos and detritus which naturally contain high levels of n-3 FA, including EPA and DHA (Ljubojević et al., 2012a). The main type of fish production in Serbia is the semi-intensivesystem for cyprinid production, carp being as the major species (Ćirković et al., 2011a). In addition to natural food, cereals are supplemented to meet energy requirement. Some fish farms increase production by introducing extruded completed feed for carp. The cost of inputs per unit of fish weight is higher than in extensive and semi-intensive farming with addition of cereals, especially because of the high cost of fish feed that contains a high level of protein with a balanced

amino acid composition. High cost can be overcome by replacing animal origin feedstuffs with local available vegetable-derived ingredients, such as rapeseed oil (RO).

REQUIREMENTS OF COMMON CARP FOR ESSENTIAL FATTY ACIDS

Many cultured warm-water fish, including carp, require no meat or fish products in their diets (Ljubojević et al., 2012b). Carp require greater amounts of n-6 fatty acids than n-3 fatty acids for maximal growth (NRC, 1993). High levels of n-3 PUFA have been reported to depress the growth of carp (Du et al., 2008). The fatty acid requirement for carp was reported to range from 0.5 to 1% for both n-6 and n-3 PUFA (Takeuchi, 1997). The requirements for n-6 fatty acid can be met by the inclusion of linoleic acid, which is abundantly present in rapeseed oil. The relatively low requirement of those fish for n-3 fatty acids coupled with the low dietary lipid requirement (Du et al., 2008). Becausee of that facts, inclusion of fish meal and fish oil in carp culture is very low (Tacon et al., 2008) and therefore the substitution of fish meal and oil could be considerably easier than for carnivorous aquaculture.

FACTORS AFFECTING PRODUCTIVITY, LIPID CONTENT AND LIPID QUALITY OF COMMON CARP

Common carp meat is rich in protein and n-3 PUFA, including EPA and DHA (Steffens et al., 2005). Feeding extruded formula increased production per hectare of pond surface area almost doubled compared with feeding supplemental grains and almost thrice compared with feeding only natural food (Ljubojević et al., 2013b). Depending on age, rearing system, and food, fat content varies from 2.3 to 17% and protein content varies from 14 to 18% in carp (Ljubojević et al., 2013c). Supplementary feeding with grains leads to enlarged amounts of crude lipid in fish meat and it was doubled higher compared to supplementary feeding with extruded formula and three-fold higher compared to carp which ingested only natural food (Ljubojević et al., 2013b). In common carp, the n-3:n-6 ratio varies between 0.8 and 2.4 (Steffens et al., 2005). Other studies reported a smaller ratio, for example 0.92 (Ćirković et al., 2012); 0.54 (Ćirković et al., 2011b, Ljubojević et al., 2013a). Ćirković et al. (2011a) found that it is possible to influence the fatty acids composition of lipids through rearing conditions, particularly feed type. According to research conducted by Ćirković et al. (2012), cultured carp grown on natural food had a high content of both n-6 and n-3 fatty acids and Ćirković et al. (2011a) observed that PUFA/SFA ratio was the most favourable in carp fed complete feed mixtures, and the least in carp fed with maize and wheat.

RAPESEED OIL

Rapeseed is crushed to produce rapeseed oil for animal nutrition and industrial applications, and the resultant rapeseeds meal which is used as a protein sources in animal nutrition. Seeds contain 38-48% oil, 18-28% protein, eruic acid below 0,1%, and glucosinolates up to 10 μmol/g (Stanaćev et al., 2006). Rapeseed oil has a very low level of SFA (7%), relatively high content of MUFA (mostly OA, C18:1n-9), moderate amount of ALA (13%) and favorable ratio LA/ALA and n-3/n-6 1:2 and 1:2, respectively (Pickova et al., 2007) and is commonly used in feed for salmonids as a replacement for fish oil.

INFLUENCE OF RAPESEED OIL ON PRODUCTION PARAMETERS AND FLESH QUALITY

There were no adverse effects of diet on the growth performance, survival percent and whole body proximate composition of the cyprinid fish species in which RO did not affect the growth parameters of these animals over either short or long-term periods (Wiegand, 1993; Pozernick and Wiegand, 1997). The RO contains minor bioactive lipid compounds of which phytosterols might be the ones with most influence on fish metabolism. Although phytosterols are absorbed in small amounts, they may compete with cholesterol for cellular binding sites, resulting in lowered cholesterol levels (Ostlund, 2004). Common carp fingerlings fed diets supplemented with either 10% FO or RO did not show any significant differences in growth and feed conversion efficiency (Steffens et al., 1995).

CONCLUSION

Rapeseed oil can serve as a useful source of lipids for common carp. It is an excellent source of energy and essential fatty acids. The production performance of this vegetable oil fed carps is very often unchanged. The usage of rapeseed oil in common carp nutrition is still limited due to presence of antinutritional factors and disorders in fatty acid flesh composition. Using rapeseed oil as replacement fat sources can further improve productivity and nutritive value of carp. In general, common carp muscle has a favourable fatty acid composition and should be regarded as a healthy product in human nutrition.

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