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SUMMARY

This novel output showed that common carp (*Cyprinus carpio*) fed with a patented feeding system that provided higher n-3 PUFA (Poly Unsaturated Fatty Acids) produced fillets with higher level of n-3 fatty acids and n-3/n-6 ratio than normal common carps, while at the same time storage stability of the carp fillets was positively affected.

KNOWLEDGE NEED

Seafood is an important source of high-quality protein and is naturally rich in valuable nutrients for a healthy diet. Among the nutrients beneficial for human health are n-3 polyunsaturated fatty acids (n-3 PUFA). Many marine fish contain high levels of these fatty acids. Freshwater fish are also an important source of n-3 fatty acids but usually contain lower levels due to the lack of n-3 PUFA in their food chains. Common carp is a farmed freshwater species that is typically fed a diet containing a high level of cereals, which accumulates high oleic acid levels, but low levels of n-3 PUFA in muscle. Although most carp are sold alive in Central and Eastern Europe (CEE), there is an increasing need for processed carp. A major goal of carp aquaculture strategies in CEE countries is the development and modernisation of carp processing. As increasingly fewer consumers want to handle live fish at home, the demand for ready-to-cook carp or carp fillet is expected to increase, especially for chill-stored fillet. Recently, a patented system by Mraz *et al.* (2011) for farming "omega-3 common carp" (OCC) was established. Common carps produced by this system show higher levels of n-3 fatty acids and n-3/n-6 ratio in their fillets than normal common carps (NCC) from traditional semi-intensive culture systems. Usually, high n-3 PUFA leads to lower storage stability due to fatty acid susceptibility to oxidation. Therefore, it is important to understand the effects of feeding this patented feed mixture to common carp on the storage stability of its fillets.



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POTENTIAL IMPACT

- Improved sustainability of the carp farming sector due to a more nutritious product that has good storage stability.
- Improved health of carp consumers due to increased consumption of dietary n-3 PUFA fatty acids, which could bring benefits to human health, such as preventing cardiovascular disease and inhibiting cancers and inflammatory diseases.

EATiP - Strategic Research and Innovation Agenda (SRIA) Thematic Area 1 - Product, Quality, Consumer Safety & Health, Goal 2. To see the full list and descriptions of the thematic areas and goals, please visit: bit.ly/3glUugM

UNDERLYING SCIENCE

Four-year-old normal common carp (NCC) and omega-3 common carp (OCC) raised in a patented feed culture system were obtained from ponds in Czechia (22 of each type of carp). Five whole fish were used for rigor mortis analysis. 17 fish were descaled and filleted, with the small pieces kept separately in plastic bags and refrigerated at $4.0 \pm 0.5^\circ\text{C}$. Adenosine triphosphate (ATP) was analysed for each fish. ATP concentrations and the products obtained from its breakdown were used to measure fish freshness. Lipid content and fatty acid profile were also analysed, as well as colour properties, texture and drip loss, and cooking loss.

RESULTS

- When fresh, the carp fed with the patented feed mixture comprising higher n3-PUFA had a higher level of n-3 fatty acids in the fillets, but showed no major difference in quality (e.g. colour, texture) from the traditionally fed carp.
- As storage extended (6-day chilled storage), OCC exhibited slightly higher preservative stability and better muscle quality than traditionally fed carp (slightly lower lipid oxidation, microbial population, dripping loss, cooking loss and higher hardness).
- Considering the better lipid profile and higher n3-PUFA content of the OCC, the modified feeding technology shows a positive impact on common carp quality and storage stability.

END-USERS & POTENTIAL APPLICATIONS

END-USER 1: Common carp farmers and managers

APPLICATION: Production of common carp with slightly higher storage stability and improved nutritional quality.

END-USER 2: Common carp researchers

APPLICATION: Researchers can use this knowledge to build upon and carry out research into other impacts of the same feeding mixture, e.g. nutritional value of the meat, sensory traits, potential contaminants, etc.

END-USER 3: Common carp processors

APPLICATION: Producing carp with better nutritional quality and increased food security by avoiding less favourable storage solutions

END-USER 4: Wholesale and supermarkets

APPLICATION: Sale of carp with improved nutritional quality that can be stored for longer.

END-USER 5: Carp consumers

APPLICATION: Consumption of carp with a higher nutritive value.

STATUS

Technology Readiness Level (TRL) 8 - system complete and qualified.

- The research is complete. Studies on fish feed, fish farming system, fish preservation, fish products development and fish benefits on human health have been carried out. The patented feed has been applied into carp farming in Czech Republic and the n-3 enriched carp products are already available on the Czech market. See: omega3kapr.cz

AT A GLANCE

TITLE: Effect of patented feed with high n-3 PUFA on post-mortem storage stability of common carp

KNOWLEDGE TYPE: Scientific publication

WHERE TO FIND IT: Hao, R., Pan, J., Tilami, S.K., Shah, B.R., Mráz, J. (2020). Post-mortem quality changes of common carp (*Cyprinus carpio*) during chilled storage from two culture systems. *Journal of the Science of Food and Agriculture*. DOI:10.1002/jsfa.10618

STATUS: Complete

TNA FACILITY USED: University of South Bohemia in České Budějovice

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PATENTS OR OTHER IPR EXPLOITATIONS: The patented technology mentioned in this research was created previously by Dr Jan Mraz, in Czechia in 2011.

Jan Mraz, Jana Pickova, Pavel Kozak. Feed for common carp and method of rearing common carp with increased content of omega 3 fatty acids. EP2462814A3.

