Centre for Cyanobacteria and their Toxins

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"Cyanobacterial water blooms: effects, consequences and management"

BOOK OF ABSTRACT

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DO CYANOBACTERIAL WATER BLOOMS INFLUENCE THE FISH MUSCLE QUALITY?

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The objective of this work was to evaluate the influence of cyanobacterial water blooms on
muscle composition of the common carp (Cyprinus carpio) and the silver carp
(Hypophthalmichthys molitrix). Fish were reared under natural conditions without additional
feeding. Experimental fish were placed into cages in store-ponds with cyanobacteria water
blooms for 28 days. Control fish were placed into the cages in store-pond without
cyanobacterial water blooms. After exposure they were placed to the pure water for the same
time. Samples of muscle were taken every week. Indices of chemical muscle composition (dry
matter, proteins, fat and ash matter), content of fatty acids (FA) and amino acids (AA) were
determined. The contents of microcystins in water and in muscles, liver and skin of fish were
monitored, too.

The highest content of microcystins in water was at the start of the experiment (7.4 µg.L⁻¹). It
was lower (3.7 µg.L⁻¹) at the end of the exposure. The muscle of the silver carp and the common
carp contained the highest amount of microcystins (4 and 1.6 ng MC-LR g⁻¹, respectively) in the
2nd week of exposure. Then and after transfer into the clean water the amount of microcystins
decreased. The highest content of microcystins in the liver was about 10 times higher than in the
muscle, but the peak concentration occurred later in comparison with the content in muscle.

There were minimal changes of chemical muscle composition indices in the common carp
exposed to cyanobacterial water bloom compared to control group. Muscle composition
changes in the silver carp were more pronounced. Changes included also the spectrum of fatty
acids and amino acids. There was a marked drop in fatty acids, in particular mono as well as
polyunsaturated ones. The drop in the n-3 (including EPA and DHA) levels led to a lower ratio
of n-3/n-6. Considering the spectrum of amino acids, there was a significant rise in the level of
cystine, methionine, threonine and proline and a drop in serine, glutamic acid, alanine, leucine,
lysine and arginine. When experimental fish were transferred into fresh and clean water, the
values returned partly to normal. The trend was the same as in study by Kopp et al. (2006): no
significant changes in the common carp and significant changes in the content of fatty acids and
amino acids in silver carp. The authors also describe increase of total fat, dry matter and weight
of the silver carp exposed to cyanobacteria. We can summarize that the changes are typical for
the silver carp, for which water blooms of cyanobacteria present indispensable part of feeding
content. Thus the changes in muscle composition of the silver carp are more pronounced in
comparison with the common carp that do not digest cyanobacterial water blooms at all. The
changes are dependent on the structure of water blooms and can negatively influence the muscle
composition of the silver carp.

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