SUMMARY

Fish farming is not only the most promising sector of animal production, but most of all, a source of wholesome and safe food. The main factor determining the development of aquaculture is the use of feed, which should not only cover the nutritional requirements of the fish, but also be environmentally safe and economically profitability. Currently used commercial feeds contain a significant share of such components as fish meal and fish oil, which are characterized by high levels of polyunsaturated fatty acids, essential in fish diet. These lipids are susceptible to autooxidation processes which result in the formation of oxidation products such as aldehydes, ketones and free radicals. The presence of oxidized lipid products in the diet can affect fish and/or worsen antioxidant vitamin deficiencies, resulting in pathological conditions that include liver degeneration, spleen abnormalities and anemia. The intensity of oxidation processes may be influenced by environmental factors, such as temperature, as well as dietary factors, including lipid content, and the degree of unsaturation of fatty acids. In order to reduce the loss of these valuable fatty acids, antioxidants, most often synthetic, such as butylated hydroxyanisole (BHA) and butylated hydroxytoluene (BHT) are added to fish feed. The effects of the use of these compounds may not only be changes in the liver and kidneys, but also anemia and decreased immunity of the fish. In order to prevent the resulting side effects and taking into account the concerns of consumers related to the consumption of products containing synthetic antioxidants, research is carried out on the use of natural antioxidants, including squalene. However, the available literature does not provide data on its effect on fish metabolism.

The purpose of this doctoral dissertation was to evaluate the effect of squalene supplementation on the effectiveness of rearing (growth rate, feed nutrient ratio, protein efficiency ratio), fish health condition and fatty acid profile in the muscles and liver of Siberian sturgeon *Acipenser baerii*, rainbow trout *Oncorhynchus mykiss* and Eurasian perch *Perca fluviatilis*.

Rearing of the tested fish species were carried out in recirculation circuits, the circulation consisted of 9 tanks with a capacity of 0.50m^3. Three separate experiments were performed for each species tested.

Experiment A - Siberian sturgeon (n = 180) with an average total length - 27.56 cm and a weight of 40.61 g.

Experiment B - rainbow trout (n = 180) with an average total length - 13.26 cm and a weight of 26.57 g.

Experiment C - Eurasian perch (n = 180) with an average total length of 11.60 cm and a weight of 23.75 g.

During each experiment lasting 56 days, the fish were fed with experimental feeds with a balanced composition taking into account the nutritional requirements of a given species. The feed was fed at the level of 1.3% (rainbow trout) and 2% (Siberian sturgeon and Eurasian perch) of the fish biomass. The addition of squalene in the experimental feeds was 0.5 and 1%, respectively. The prepared feeds were isoenergetic and iso-protein. Breeding indexes, hematological and biochemical blood indexes, histological picture of the liver, fatty acid profile and squalene content in the muscles were analyzed.

On the basis of the obtained test results, the content of squalene was found only in the muscles and liver of Siberian sturgeon, in the muscles only in the group with 1% addition of squalene, and in the liver in both groups fed with fodder supplemented with this additive, which suggests that the metabolism of squalene in salmonids and perch is faster than that of sturgeon fish.

Obtained changes in the values of hematological indicators (MCV, MCH and RBC) as a result of administration of squalene, were within the range of values acceptable for the tested species of fish. Biochemical indicators also changed, including the level of triglycerides in the blood of rainbow trout and cholesterol in the blood of Eurasian perch, but these changes did not adversely affect the health of the studied fish. Squalene addition in fish diet also influenced the histological picture of the liver, which showed drops of lipid substances and pycnotic cell nuclei. However, no other pathological changes, including changes in the activity of liver enzymes, were found.

The addition of squalene increased the amount of polyunsaturated fatty acids (PUFA), n-3 acids and eicosapentaenoic (EPA) and docosahexaenoic (DHA) acids in the muscles and liver of Siberian sturgeon, rainbow trout and Eurasian perch.

The feeding of Siberian sturgeon, rainbow trout and Eurasian perch with the addition of squalene in the amount of 0.5 and 1% did not affect the growth rates, although there was a tendency to lower the feed index (FCR) and increase the relative weight gain (SGR) and the index Protein Growth Efficiency (PER).

Studies have shown that squalane can be safely used in doses ranging from 0.5 to 1% in feed for Siberian sturgeon, rainbow trout and Eurasian perch.