

EFFICIENCY OF NEW *BALTIC PROBIOTICS* PRODUCTS ON FISH GROWTH AND FUNCTIONING OF AQUACULTURE SYSTEMS

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Introduction

Aquaculture is one of the fastest growing food production sectors in the world. In large-scale production facilities, where aquatic animals are exposed to stressful conditions, problems related to diseases and deterioration of environmental conditions often occur.

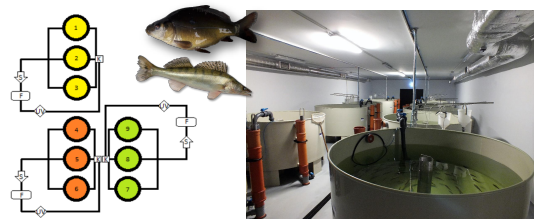
One of the potential solutions for the above mentioned problems are *probiotics*.

Within the Baltic Blue Biotechnology ALLIANCE project "Baltic Probiotics" Company created 2 new recipes of probiotic-based products:

1) liquid supplement that improve and regenerate water quality;

2) complementary feed additive for aquaculture fish that stabilizes the microflora of the gastrointestinal tract of fish, improves digestive processes and increases weight gain.

The task of this study was to test efficiency of these two probiotic products on aquaculture targeted fish species (predatory pikeperch and omnivorous carp) and on the (biological) system functioning in recirculating and pond aquaculture.



Probiotic experiment in RAS with pikeperch and carp juveniles

3 experimental groups: Control (C) (no probiotics added)

Fish feed (F) (probiotics concentration of 3 ml/kg feed)

Water (W) (probiotics at concentration of 1 ml/m³ water)

The same experiment design (above) was used for pikeperch and for carp. Pikeperch experiment started with 200 individuals per tank (fry of about 1 g in weight), carp experiment – 270 fish (weighing 5 g on average) per tank. Pikeperch experiment lasted 5 weeks, carp experiment took 2 months. Every day water main water parameters (temperature, oxygen, pH) and fish health and survival was monitored.

Once every week water samples from each fish tank and biofilter were taken for nutrients (total P, NH₄, NO₂, NO₃, PO₄) and bacteria abundance analysis. Nutrients analyzed using Skalar San++ Continuous Flow Analyzer and bacteria abundance - using Flow cytometry.

Three replicates (before probiotic application, one month after and at the end of experiment) of fish from the tank were sampled for intestine morphology analysis.

Along with intestine morphohistology samples also paired samples for genetic identification of probiotic bacteria in intestine were taken for carps.



Probiotic experiment in carp aquaculture ponds.

Carp pond aquaculture experiment was performed in commercial ponds of aquaculture company "Kintai". Two 1 ha area ponds of first summer fish were available for experiment (no replicates). The task was to assess ecosystem response to probiotic treatment by measuring water chemistry, biogeochemical nutrient cycling, primary production, zooplankton and fish growth.

Experiment took from June to July.

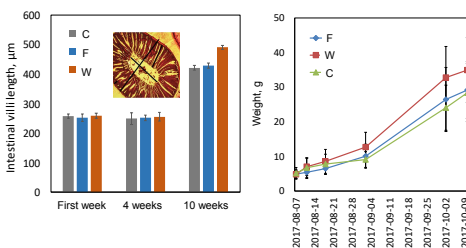
Surface water samples were analysed for nutrients (total N, total P, NH₄, NO₂, NO₃, PO₄) and bacteria abundance. Water temperature and oxygen concentration was tracked daily using automatic data loggers.

Primary production evaluated as *chl a* concentration, zooplankton density was counted and fish growth was measured (length and weight) before probiotic treatment (June 6), 2 weeks and 4 weeks after the treatment of one (Probio) pond.

Results

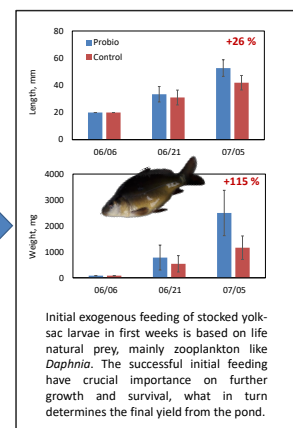
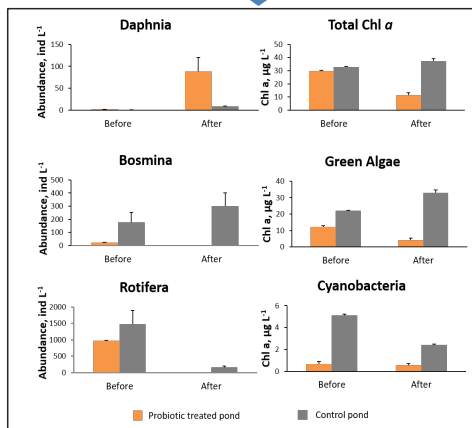
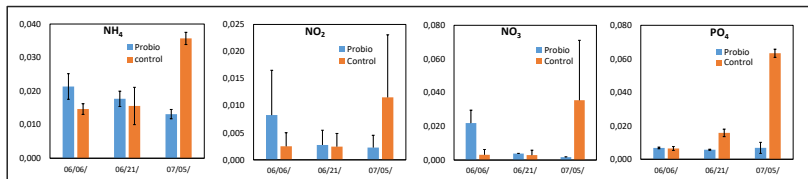
Main findings from the experiment in RAS with pikeperch and carp

- No clear results on biological water treatment capacity improvement in RAS were obtained.
- Probiotic bacteria were found in the intestine of fish from all experimental groups.
- Changes in carp juvenile intestine were detected in two month period – the intestinal villi length, so the intestine absorption surface area was higher in water probiotic (W) experimental group ($p < 0.05$).
- The growth of carp and pikeperch juveniles was better in water probiotics (W) group ($p < 0.05$), but not in probiotic-treated feed group.



Water probiotic had better effect on RAS cultivated fish.

Main findings from the experiment in carp aquaculture ponds



Final increase in fish production comparing to control pond after one year was ~100 %.

Smart Fishery

A biological preparation for improving the quality of water in fish farms

baltic probiotics

INDICATIONS:
Infectious and parasitic diseases, bacterial diseases, viral diseases, and ectoparasites, ectoparasites, and ectoparasites.

STORAGE:
Store at 10-15°C temperature and avoid direct sunlight. Do not use after the expiration date.

USE:
Add 1 ml of Smart Fishery to 1 m³ of water. For fish farms, add 1 ml of Smart Fishery to 1 m³ of water. For fish farms, add 1 ml of Smart Fishery to 1 m³ of water.

SMART FISHERY: A biological preparation containing effective microorganisms and phyto-fertilizers for improving the microbiological quality of water.

- limit the spread of pathogens and fish diseases;
- eliminates the causes of pollution;
- inhibits the formation of ammonia and hydrogen sulfide;
- creates favorable conditions for increasing fish weight and reproductive function.

100% EFFECTIVE

Interreg

This product was supported by the Baltic Sea Interregional Alliance project.

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