

**Project name:** IRN AP19576848 «Development of dry, waterproof, full-ration extruded feed based on a symbiotic recipe to increase fish productivity and assess the quality of fish products»

**Relevance:** Currently, one of the main tasks of the agro-industrial complex is to meet the needs of the population in high-quality fish products, which is impossible without increasing the productivity of fish. Recently, scientists have begun to use symbiotics, probiotics in feeding fish. Numerous works of foreign and Russian scientists on testing symbiotics in fish farming have shown the possibility of their successful use as an additive to feed. There is reason to hope that the use of symbiotic preparations in feeding fish can have a significant positive effect. Previous studies in this direction can be characterized as fragmentary and do not provide sufficient information on the rationale for the use of symbiotics in the composition of fish feed, especially in Kazakhstan.

**Purpose:** To develop dry waterproof full-ration extruded feeds based on a symbiotic recipe to increase the productivity of fish and give a veterinary and sanitary assessment of the safety and quality of fish products when using them.

**Expected and achieved results: As a result of the project implementation, the following will be published:**

- at least 2 (two) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the project, indexed in the Science Citation Index Expanded of the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 35 (thirty five);
- at least 1 (one) article or review in a peer-reviewed foreign or domestic publication recommended by the CCIS;
- at least 1 (one) article or abstract in the materials of the international conference;
- 1 (one) recommendation on the use of developed feed based on a symbiotic recipe will be prepared;
- 1 (one) patent of the Republic of Kazakhstan will be obtained based on the results of research;
- 2 (two) dry water-resistant complete extruded feeds based on a symbiotic recipe will be developed to increase the productivity of tilapia and African catfish, with a scientific justification for each component of the recipes;
- a veterinary and sanitary assessment of the quality and safety of the developed feed will be carried out by assessing the overall toxicity using biological research methods;
- an assessment will be made of the effectiveness of the developed feed on the productive qualities of tilapia and African catfish when grown in a recirculating water supply system;
- an assessment will be made of the effectiveness of the developed feed on the productive qualities of tilapia and African catfish when grown in a recirculating water supply system;
- 1 seminar or round table with SHTP will be held;
- at least the 1st final master's work will be prepared.

One (the first) dry waterproof complete extruded feed based on a symbiotic formulation has been developed to increase the productivity of tilapia, and a scientific basis for each component of the recipe has been given.

To obtain the symbiotic, we gutted the fish, cleaned and washed the intestines. For isolation of pure colonies of lactobacilli and cultivation on solid nutrient media. Sequencing of the isolated lactobacilli was carried out and a phylogenetic tree was built from nucleotide sequences. According to the developed recipe, feed for tilapia was made from soybean cake, methionine, fish meal, wheat and lactobacilli and yeast. A veterinary and sanitary assessment of the quality and safety of feed was carried out by assessing general toxicity using biological research methods. The analysis showed that the food samples did not have a toxic effect on protozoa. In the KATIU samples, the total number of microbial numbers was detected, which amounted to no more than 16 - 28 colonies, which does not exceed the norm. The indicators of aflatoxins B, B1, G and G1 were no more than 0.002 mg/kg in all samples. The concentration of deoxynivalenol in the studied samples varied from 0.15 mg/kg to 0.22 mg/kg, which also corresponds to the standards. The swelling of granules in all samples of KATIU feed was 38 minutes, and in commercial feed – 32 minutes. During the experiment, the average absolute increase in the control group was 8.3 g, the relative increase was 20%. In the groups fed with experimental compound feeds, the absolute gains were 11.75 g and 10.75 g, and the relative gains were 26.5% and 26.2%, respectively. When conducting a veterinary and sanitary examination of the fish in the experimental group, according to the organoleptic indicators of tilapia meat, the tilapia meat was fresh, benign, and in appearance the surface of the fish was glossy and shiny. When conducting physicochemical studies of tilapia meat, all indicators were also normal. When determining the chemical composition of tilapia meat, the mass fraction of protein in the experimental group was 19.52%, and in the control group 18.43%. The mass fraction of fat in the experimental group was 0.30%, and in the control group 0.24%. The mass fraction of carbohydrates was not detected in both groups. In the meat of the experimental group of fish, an increase in the concentration of amino acids was observed: arginine - 3.253%, lysine - 1.626%, tyrosine - 0.747%, phenylalanine - 1.582%, histidine - 0.835%, methionine - 0.791%, threonine - 1.319%, serine - 1.187% compared with the control group.

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**Study group members:**

**Grzegorz Zwieschowski** – co-executor and foreign consultant highly qualified scientist, PhD, associate professor of the Department of Biochemistry, biologist, livestock specialist at the University of Warmia and Mazury in Olstein (Poland), postdoc of the Department of Agriculture, Food and Dietology, University of Alberta (Edmonton, Canada).

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Also, 2 undergraduates and 1 student are involved in the project as technical staff. The theme of their dissertations and theses is directly related to the theme of the project.

#### **Information for potential users:**

According to a review of the literature of Kazakh authors in the Republic of Kazakhstan, studies were previously conducted to study the effect of various feeds based on phytobiotics for fish, but there are no studies on the effect of feeds based on symbiotics. Although the use of feed based on symbiotics for fish has long been practiced abroad, excellent results have been obtained in increasing the productivity of fish, in improving the intestinal microflora of fish, which has a positive effect on increasing immunity to various infectious diseases. At present, feed and feed additives for fish based on symbiotics are not being developed in the Republic of Kazakhstan. To carry out such tasks, knowledge and skills in the field of fish farming, animal husbandry, veterinary and sanitary examination of fish products, as well as a basis for conducting experimental studies on feeding the developed feeds and feed additives to fish are necessary for the subsequent study of their impact on fish biological indicators, the productive qualities of fish.

Similar works on the development of new fish feeds based on symbiotics and their impact on the physiological state of fish and their productivity are currently being studied by many foreign researchers, including Russian scientists. Therefore, the topic of the project is still relevant and its significance on a national and international scale is beyond doubt.

#### **Additional Information:**

In the process of performing research work, innovative patent of the Republic of Kazakhstan will be issued in co-authorship with the research group, while the patent holder will be NJSC S. Seifullin KATIU.