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PROSPECTS FOR USING FERMENTED FISHMEAL IN AQUACULTURE

Modern aquaculture faces serious limitations in the availability of high-quality protein feeds due to declining commercial fish stocks and increasing the competition for fishmeal raw materials.

At the same time, the volume of fish waste generated during processing and cutting is increasing, and often remains unused. Under these conditions, the development of alternative feed components – such as fermented fishmeal obtained from secondary raw materials and subjected to fermentation – is becoming particularly urgent [2].

Fermented fishmeal (FFM) is a product obtained through controlled enzymatic or microbiological hydrolysis of fish raw materials, which increases the protein biological value, improves its digestibility, and reduces the content of insoluble fractions.

The technological process for producing FRM includes the following key stages: grinding raw materials, selecting enzyme preparations or microbiological cultures, adjusting the conditions (temperature, pH, processing time), separating the liquid and solid fractions, drying the final product. For example, the studies indicate that hydrolysis using enzymes at

a dosage of about 0.5 PU/g protein and for about 40 minutes ensures optimal recovery of low molecular weight peptides [1].

Fermentation results in an increase in the proportion of peptide fractions and free amino acids, which improves the protein digestibility for the fish with immature digestive systems. The biochemical profile of FRM is similar to that of fishmeal, but requires microbiological and technological control, as the product safety and stability remain key aspects.

From the point of view of the raw material base, fish processing waste (heads, viscera, fins, and bones) represents a significant reserve: about 43 % of the world fishmeal production comes from waste processing [1].

When using PRM in starter feeds for juvenile fish, it is important to consider that early stages of fish development are characterized by low protease activity, so pre-hydrolyzed protein may be physiologically more suitable. Several studies have demonstrated the positive effect of fish hydrolysates on the growth and survival of juveniles.

From a long-term perspective, introducing PRM allows: (1) to reduce the dependence on commercial fish stocks, (2) to increase the resource efficiency of the industry through the use of waste, (3) to improve the feed digestibility and potentially accelerate the growth of juveniles [1].

However, the implementation requires solving a number of problems: standardizing technological modes (enzyme/raw materials, time, temperature), ensuring product stability, validating the data across different fish species and growing conditions, and an economic assessment. It is especially important to conduct a research on the dosage of FRM, its impact on the fish digestive system, metabolism, and immunity.

Furthermore, it is crucial to assess the environmental and economic impact, including the cost of enzyme preparations, energy consumption, equipment, logistics, as well as the impact on the aquatic environment and the sustainability of feed chains.

Fermented fishmeal is a promising component of juvenile fish diets in aquaculture. It combines the technological innovation and resource-saving potential. Its widespread adoption requires a comprehensive research and adaptation program: technological optimization, biological testing on the key fish species, an economic implementation model, and an environmental assessment [3].

If successfully implemented, FRM could become an important element of sustainable aquaculture systems, especially as the resource base of traditional feeds is continuing to decline.

References

1. The State of World Fisheries and Aquaculture. Contributing to food security and nutrition for all. Rome, Italy : FAO, 2024. 264 p.
2. Півоваров О. А., Ковальова О. С., Кошулько В. С. Інноваційні технології переробки риби, рибних відходів, нерибних і морських продуктів : навчальний посібник. Дніпро : ДДАЕУ, 2024. 334 с.
3. Рибне господарство: традиції та інновації. Вітчизняний та світовий досвід / упоряд. Фесун Т. П. Київ : Науково-технічна бібліотека. Національний університет харчових технологій, 2021. 221 с.
4. Burhaz M. I., Soborova O. M. Feed policy in Ukrainian aquaculture: trends, challenges, and impact on competitiveness. *Scientific Messenger of Lviv National University of Veterinary Medicine and Biotechnologies. Series: Agricultural sciences*. Lviv, 27 (102)/25. P. 349–354.