



## **STUDY OF THE PROTEIN COMPOSITION OF FISH FEED OF DIFFERENT ORIGINS**

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### **Abstract**

The best recipes of domestic and foreign fish feed contain up to 9-12 components of various nature, not counting the addition of vitamins, mineral salts and other biologically active substances.

**Keywords:** protein, compound feed, fish, Kjeldahl method, fish food samples

### **Introduction**

To provide the country's population with protein-containing products, fish farming and processing are being developed. In particular, 400 thousand tons of fish were grown in Uzbekistan in 2021, and 700 thousand tons are planned to be grown in 2022. Of course, providing the fish farming industry with good-quality feed and processing such a quantity of fish turns into a problem.

Fish feed includes raw materials of animal and vegetable origin, products of microbiological and chemical synthesis, as well as a variety of by-products and waste products of the food industry. There is an opinion: the more diverse the composition of feed, the higher their nutritional value. It has been established that feed protein, which is the sum of proteins of animal, plant and microbial origin, has the maximum efficiency.

Determining protein quality is important for many purposes, including understanding how much of a particular protein may be needed, which protein source is preferred under certain conditions (for example, when recovering from illness or intense long-term sports), and which proteins can be combined to compensate for them. low quality. In addition, if protein intake is limited for some reason, then choosing a higher quality protein will be optimal.





Components of animal origin. Animal processing products are the most important components of mixed feed for fish. They are the main source of complete protein and vitamins, rich in minerals, contain vital nutrients that are not found in other types of raw materials. An important advantage of most feeds of animal origin is the high digestibility of the amino acids that make up the structure of their protein. The group of components of animal origin includes fish meal, krill meal, meat and bone meal, meat meal, blood meal (albumin), greaves meal (residue after rendering fats), bone meal, feather meal, crab meal, silkworm chrysalis, dry skim, skimmed milk powder and some other types of raw materials.

Components of plant origin. Vegetable products, depending on the composition of the main nutrients, are divided into three groups - rich in starch, protein or fat. The content of nutrients and mineral elements in some components of plant origin used in the manufacture of fish feed are presented in table.1.

If the diet for fish has the required amount of fats and carbohydrates, then the protein is used in protein metabolism for the growth of the body's body. With a lack of fats and carbohydrates in the diet, proteins can be used as an energy source in functional metabolism. This is not economical as protein is the most expensive feed ingredient. It can be assumed that the biological value of a protein is the higher, the closer its amino acid composition is to that of fish protein. However, it has been shown that the amino acid composition of fish body protein can only serve as an approximate guide to the formation of feed protein.

The need for protein in fish is much higher than that of warm-blooded animals. For example, for juvenile salmon fish, the optimal level of protein in the feed is 45-55%, for adult fish - 40-45%. For adult carp fish, the need for protein is lower - 35-40%. However, the starter feed for cyprinids should also contain a high level of protein - 50-55%.

Table 1 Composition and nutritional value of feed of plant origin, g/kg of feed

Indicators	Corn		Wheat soft	oats	Rye	Barley	Soya	Wheat bran	Bran		
	white	yellow							linen	soy	Sunflower
organic matter											
Proteins	92	103	133	108	120	113	319	151	340	439	429
Fats	43	42	20	40	19	22	146	41	17	27	38
Carbohydrate	43	38	17	97	21	49	70	83	96	62	144
mineral elements											
Calcium	3.7	5.2	3.4	4.4	4.8	5.0	21.7	10.9	12.5	19.8	8.0
Phosphorus	2.7	5.2	3.6	3.4	2.8	3.9	7.1	9.6	8.3	6.6	12.2
Magnesium	1.5	1.4	1.0	1.2	1.1	1.0	2.9	4.3	5.3	3.5	5.1
Potassium	0.4	0.5	0.8	1.5	0.9	2.0	4.8	3.0	2.8	2.7	3.6
Sodium	0.1	1.3	0.1	1.8	0.1	0.8	3.4	0.9	0.8	0.4	0.4



The assimilation of feed proteins by fish depends on the species of fish, age, water temperature, protein concentration in food. The most effective is compound feed with a content of 40-65% of calories due to protein. Protein utilization increases as fat levels rise to certain limits. For 1 kg of fish growth, 550-650 g of protein is required if the feed is balanced in terms of nutrients. If this value increases, then this indicates an insufficient balance of the feed.

So, the main components that contribute to weight gain is the protein composition of the feed. It is determined by the well-known Kjeldahl method. Table 2 below shows several recipes for fish feed and determines the amount of proteins in them, the results of the studies are entered in table 3.

Table 2 Feed recipe, %

№	Compound	In the recipe according to samples,%			
		№1	№2	№3	№4
1	Wheat	14,00	-	-	14,00
2	Barley without films	12,60	-	-	
3	Wheat bran	10,00	20,00	3,00	35,00
4	Feed meal wheat	15,50	-	-	-
5	sunflower meal	33,52	20,00	-	-
6	Meat and bone meal	2,00	-	-	2,00
7	Sunflower oil	0,86	-	-	1,00
8	feed yeast	9,00	20,00	40,00	-
9	Fish flour	-	15,00	25,00	3,00
10	meat and bone meal	-	11,00		-
11	Wheat flour	-	13,00	3,00	-
12	Premix	-	0,86	2,00	-
13	Powdered milk	-	-	11,00	-
14	Shrot. soy	-	-	14,00	-
15	Pea flour	-	-	5,00	-
16	Barley	-	-	-	12,60
17	Cotton meal	-	-	-	32,00
18	Sunflower oil	-	-	-	-
	Total	100	100	100	100

### Processing the Results of Experiments

There are protein coefficients equal to a unit mass of total nitrogen, which vary depending on the type of product. Listed in Table 3 below.



Table 3 The amount of protein in fish feed

Sample №1		Sample №2		Sample №3		Sample №4	
V	13,5	V	12,1	V	56,7	V	23,5
V <sub>1</sub>	0,1	V <sub>1</sub>	0,1	V <sub>1</sub>	0,1	V <sub>1</sub>	0,1
K	0,1	K	0,1	K	0,1	K	0,1
c	14,0067	c	14,0067	c	14,0067	c	14,0067
K <sub>2</sub>	6,25	K <sub>2</sub>	6,25	K <sub>2</sub>	6,25	K <sub>2</sub>	6,25
m	0,3298	m	0,3344	m	1	m	1,04
c	1000	c	1000	c	1000	c	1000
<b>X<sub>(Protein)</sub> = 35,6 %</b>		<b>X<sub>(Protein)</sub> = 31,4 %</b>		<b>X<sub>(Protein)</sub> = 49,5 %</b>		<b>X<sub>(Protein)</sub> = 19,5 %</b>	

The mass fraction of nitrogen (X) in the test sample as a percentage during the distillation of ammonia into boric acid is calculated by the formula

$$X = \frac{(V - V_1) * c * 14.0067 * K * 6,25}{m * 1000} * 100;$$

where V is the volume of sulfuric acid solution cm<sup>3</sup>; V<sub>1</sub> is the volume of acid used for titration during the control measurement, cm<sup>3</sup>; c is the concentration of hydrochloric acid, mol/dm<sup>3</sup>; K is the correction to the titer of the hydrochloric acid solution, mol/dm<sup>3</sup>; 0.0014 is the mass of nitrogen equivalent to the mass of sulfuric acid contained in 1 cm<sup>3</sup> of solution, % g\*dm<sup>3</sup>/mol\*cm<sup>3</sup>; m is the weight of the sample, g; 100 - coefficient of conversion to percent; 6.25 - coefficient of conversion of the total nitrogen content to crude protein.

## Conclusion

Today, there is a growing demand in the fishing industry for fish feed containing high quality protein. The quality and quantity of protein in fish meat depends on the amount of protein in the feed given to the fish. In our experiment, the protein content was determined in 4 samples of fish feed made on the basis of recipes. The amount of proteins in sample No. 3 is the largest and amounts to 49.5%.

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