Bioresonance method for fattening trout

A.G. Avakova[one], V. Ya. Sklyarov[2], E.V. Tereshkov[3]
([one]SKNIIZH, [2]KrasNIIRKH, Krasnodar, [3]Gas Processing Plant "Adler", Adler, Russia)

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Fish is one of the most important foods in human nutrition. An insufficient amount of valuable fish products from natural fish populations is replenished by the activities of fish-breeding enterprises, both for the reproduction of fish stocks and for commercial fish farming. Modern fish farming has the character of an industrial production, which is based on the rearing of fish under controlled conditions and urgently requires the most serious attention to the production process. The purpose of commercial fish farming is to ensure the maximum yield of fish products per unit area in the shortest possible time.

Trout farming today is a science-intensive, dynamically developing industry, significant results have been achieved in creating technologies that provide for their maximum coordination with the biological requirements of fish, with a strategy for an integrated and more differentiated use of genetic, feed and technological factors. Nevertheless, today the fish farmers are faced with the task of increasing the production of competitive products, special attention is paid to biological safety.

To solve these problems, we propose the use of a new development - a method of growing juvenile fish using bioresonance effects.

The technical result is achieved by the fact that in the known method of keeping and feeding fish, including keeping in pools, balanced feeding, the electromagnetic frequency spectrum (EFS) of the preparation containing insulin is exposed in combination with the EFS of a complex of basic essential amino acids. The frequency spectrum of the preparation is transferred to the water in which the fish lives by means of the Transfer-A apparatus. The exposure begins on juveniles that have reached a live weight of 30 grams, and is carried out until the end of the growing or feeding period. One device can be used simultaneously for 10–12 tons of fish mass at a standard stocking density.

A practical illustration of the use of bioresonance technology is a scientific and economic experiment carried out at the Adler GPP in Sochi on rainbow trout. The fish were raised in production tanks for trout feeding. The experiment was divided into three periods, the duration of each was limited by the stocking density of growing fish: 1st - period - 60 days, 2nd - 30 days, and 3rd - 30 days. The entire experience took 120 days. Control weighing was carried out every 10 days. Fishing of the pools, weighing all fish and accounting for feed costs were carried out at the end of each period so that there were no differences in the content of the experimental and control groups.

At the end of each period, the fish were weighed and placed in the pools, the area of the pools, temperature regime, water quality, food and feeding conditions were identical. For feeding we used compound feed "Akvalaife R 90", manufacturer Denmark, which was given to the control and experimental groups in equal amounts. The differences consisted in the fact that a bioresonance effect was applied to the fish in the experimental pool.

The difference in the weight of fish between the experimental and control groups was manifested already at the first control reweighing, gradually increased with subsequent weighing and reached a significant level by the end of rearing (Table 1).

Table 1

The main results of the experiment

Indicators	An experience	The control	Experience / control	
			G	%
At the beginning of the experiment				
Average live weight of fish, g	33.0 33.0		-	-
Number of fish, pcs.	10000 10000		-	-
At the end of the experiment				
Safety,%	100	100	-	-
Live weight of the whole group, kg	2396	2178	+ 218	10
Average live weight of fish, g	239.6 ± 4.3 **	217.8 ± 5.1	+ 21.8	10
Growth for the entire period, g	206.6	184.8	+ 21.8	11.8
Average daily gain, g Feed	1.72	1.54	+ 0.18	11.8
consumption, kg / kg	0.76	0.87	- 0.11	14.5
Efficiency of use of feed protein,%	47.9	40.0	+ 7.9	+ 7.9

* * P ≤ 0.01

The live weight of fish in the experiment was 10% higher than in the control, the consumption of feed in the control was 0.87, in the experiment - 0.76, which is 14.5% less.

The bioresonance effect covers all levels of organization of the organism, which is clearly evidenced by changes in the biochemical composition of trout (Table 2). When analyzing the biochemical composition of samples of trout carcasses, significant differences in the protein / fat ratio were revealed; in the control it was 1.78, while in the experiment it was 2.56. Increasing the protein in trout meat and reducing the fat increases the biological value of fish as a food product.

table 2

Biochemical composition of trout carcasses

The name of indicators	The control	An experience
Moisture,%	72.80	73.56
Ash,%	1.9	2.15
Protein,%	15.29	16.01
Fat,%	8.51	6.26
Macronutrients		
Calcium, g / kg	3.02	3.68
Phosphorus, g / kg	3.24	3.20
Trace elements		
Magnesium, mg / kg	314,173	365,588
Manganese, mg / kg	0.494	0.554
Iron, mg / kg	14,498	11,351
Copper, mg / kg	0.553	0.436
Zinc, mg / kg	13.35	11.265
Selenium, mg / kg	0.075	0.075
Iodine, mg / kg	0.182	0.300
Heavy metals		
Lead, mg / kg	0.087	0.078
Arsenic, mg / kg	<0.0025	<0.0025
Cadmium	0.014	0.0028
Mercury, mg / kg	<0.005	<0.005

Moreover, in the prototype, the ash content exceeds the control by 13%. Which speaks about the better mineralization of fish tissues. Of the investigated macro- and microelements, the prototypes contain more calcium, magnesium, manganese and iodine. In the experiment, 0.300 mg / kg of iodine was determined, while in the control it was only 0.182. As you know, iodine is a deficient trace element,

especially important in the nutrition of children. The increase in mineral content displaces the content of toxic substances. So, the content of toxic metals in the meat of experimental fish is reduced, and the content of cadmium is five times, which is an indicator of the environmental friendliness of the bioresonance method of exposure.

The hepatosomatic index in fish in the control and experimental groups did not differ, however, it should be noted that the fish liver under the influence of SES insulin and amino acids looked healthier.

The biochemical composition of blood in fish from the control and experimental groups is within physiological norm (Table 3).

Table 3

Biochemical composition of blood serum

Indicators	The control	An experience
Hemoglobin, g / l	87.4 ± 4.5	91.3 ± 5.7
Total protein, g / l	58.0 ± 0.7	49.3 ± 0.8
Glucose, mol / l	2.60 ± 0.5	2.44 ± 0.5
Cholesterol, mol / l	5.50 ± 0.4	4.90 ± 0.5

However, it should be noted that the general blood picture has differences, indicating a more intense carbohydrate and protein metabolism in the fish of the experimental group. With an increased level of hemoglobin, there is a decrease in glucose, cholesterol and total protein in the blood of the fish of the experimental group in relation to the control by 6.5%, 12.2% and 17.6%, respectively. A decrease in the level of glucose, cholesterol and total protein in the blood serum, against the background of an increase in average daily gains, proves the effect of the biophysical characteristics of insulin and a complex of amino acids, which contribute to the accelerated transport of energy and building material from the blood to the tissues, and more efficient assimilation of amino acids and other nutrients of the feed.

Thus, convincing results have been obtained that indicate the effectiveness and biological feasibility of using the method of bioresonance exposure in
growing trout.

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