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## Physicochemical Properties And Growth Rate Of Carp When A New Feed Additive Being Applied.

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### ABSTRACT

The studies outlined in this paper demonstrate the effect of the "Bacell-M" feed additive on the physical and chemical properties of the experimental carp, i.e. the content of moisture, fat, ash and crude protein, the survival rate of individuals, as well as the growth rate of fish. In the course of the experiments, it has been found out that when using the probiotic additive "Bacell-M" in the fish ration, the values of bioavailability parameters in Test groups were higher compared with Control group fed with a routine diet. Monitoring the average daily weight gain has clearly reflected the growth rate of the Test carp.

**Keywords:** aquaculture, diet, feed additive, carp, growth rate, biological value.

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## INTRODUCTION

The intensification issues of aquaculture require expanding and introducing new methods and nutrients for balanced feeding rations. One of the promising areas for improving the quality of fish and increasing average daily gains in pond marketable fish farms is the use of productive feed additives in aquatic organisms' rations that enhance metabolism, growth, body resistance and product quality [1].

The purpose of the study research was to determine the effect of the "Bacell-M" feed additive on the physicochemical properties, survival rate and growth rate of the carp.

## MATERIAL AND METHODS

The methodological basis of the research was the studies of the feasibility of probiotic preparations in aquaculture by scientists in different countries [2]. Our experiments were carried out on the ponds of the full-system fishery enterprise OOO Novocherskasski Fish Factory that specializes in growing marketable fishes, both herbivorous ones and carp in the Rostov region.

To determine the effect of the feed additive on carp, the experimental product was tested in two dosages; the dosage scheme is given in Table 1. Feeding was carried out according to the same regimen that was adopted on this fish farm, i.e. in the morning and in the evening. The feeding way and places were also not changed to preserve the habitual way of life of the fish. The feed distribution to the ponds was done manually; the portion was small for convenience and control over eatability to be performed. The experiments of that kind were carried out to determine the effectiveness of the feeding way and rationing of a single feed dose.

When conducting our experiments, carp was grown on complete feed, its content is similar to that of the MPW feed. At this production plant, there was equipment for manufacturing its own feed.

The recipe for low-compound, medium-protein MPW feed, optimal in composition for consumption by marketable carp and herbivorous fish during their growing both in polyculture and monoculture, consists of fish meal 3, wheat 63, soybean meal 25, fodder yeast (hydrolyzed) 5 and protein-vitamin concentrate paprin 5 (in percentage correlation). Due to a small number of components balanced in their composition, it is not difficult to prepare, which also contributes to its application in all areas of fish farming.

The area of each experimental pond was about 70 hectares. The stocking density in each pond was about 285 pcs/ha. The individuals studied were in a satisfactory condition, the valuation found no signs of diseases, and the weight of carp corresponded to the age standards on the routine diet. The fact that changes in environmental conditions are reflected in the feeding intensity was taken into account in feeding. The experimental period was determined to last 30 days.

Numerous researchers believe that probiotics contribute to the optimization of the organs' activity, assimilation of nutrients of the compound feed, stabilization of the metabolism of carbohydrates, proteins and fats that result from the active formation and use of biologically active substances and neutralization of toxins and enzymes [3].

The "Bacell-M" feed additive was developed by the employees of OOO Biotechagro in the Krasnodar Territory; it consists of the microbial mass of living bacteria *Bacillus subtilis* 945 (B-5225) in an amount of not less than  $1 \times 10^8$  of CFU/g (colony forming units), *Lactobacillus paracasei* (B-2347) in an amount of not less than  $1 \times 10^6$  CFU/g and *Enterococcus faecium* M-3185 (B-3491) in an amount of not less than  $1 \times 10^7$  CFU/g, as well as auxiliary substances, i.e. sunflower meal or by-products of grain or legumes crops (83.95%) and chalk fodder (10%). It does not contain genetically modified components; the amount of harmful impurities is under the defect action level. The probiotic feed additive "Bacell-M" is a free-flowing powder with inclusions of particles of colour from light brown to dark brown.

Multiplying in the intestines of animals, bacteria that were part of the "Bacell-M" feed additive produce biologically active substances that increased the digestibility and absorption of nutrients, as well as contributed to the neutralization of mycotoxins and positively affected the natural resistance of the animal's body [4]. The

"Bacell-M" activated the digestion processes, the activity of the gastrointestinal tract, which contributed to increasing the productivity and preservation of animals, birds and fish [5].

The weight growth was determined every 10 days according to the control weightings. The sample size was at least 50 pcs for each variant. According to the average weight of fish, the daily ration and size of grains were simultaneously corrected [6]. The carp growth rate was assessed by the overall daily weight gain [7, 8]. The survival rate was calculated with respect to the records of dead fish after a total catch of fish at the end of the experiment.

In the research course, the chemical analysis of experimental fish was carried out according to the techniques recommended by [9]. They included the determination of moisture by drying at  $t = 105^{\circ}\text{C}$ , fat by extraction in the Soxhlet apparatus and crude protein by calorimetric determination of nitrogen multiplied by a factor of 6.25 using the Nessler's reagent. The ash content was determined by burning the investigated material in a muffle furnace at  $t = 500^{\circ}\text{C}$  and nitrogen-free extractive substance by the difference between the sum of all the substances in the sample and the sum of protein, fat and ash.

Full feeding of fish in pond farming was provided by rations balanced in all essential nutrients and enriched with biologically active feed additives, which guaranteed high growth energy and efficient use of feed for carp individuals [10].

## RESULTS AND DISCUSSION

The data obtained in the experiment showed that the biologically active substances of the feed additive under study had a positive effect on the growth dynamics of marketable carp and increase in average daily gains. They are presented in Table 2.

A significant difference in body weight had been noted in favor of the Test groups fish by the end of the experiment in proportion to the dosage of the additive fed. The result of the growth rate of the average daily gains of marketable carp confirmed the pattern established. The survival rate of carp was recorded in Control group of 82.6%, in Test (P-1) group 94.2% and in Test (P-2) group 95.1%.

This result confirmed our assumptions of positive effects on the fish as a whole and increase in the livability of individuals due to enhancing resistance.

It was decided to divide the experimental period into two stages of 15 days each in order to fully show the physicochemical process occurring in the body of the Test fish. Adding of "Bacell-M" in different dosages to the diets of carp at the first stage of the experiment resulted in changes in the chemical composition of the fish body. The moisture content in the body of the Test fish was  $76.5 \pm 1.3$  and  $77.2 \pm 2.5$ ; and  $80.2 \pm 1.6\%$  in Control group. Differences in this parameter between the Test and Control did not exceed 4.6%, with ( $P < 0.01$ ) being significant. The feed additive in the diet contributed to an increase in protein level. The differences between the Test and Control fish amounted to 3-4.3% and were significant ( $P < 0.05$ ). The fat contents in Test groups were  $6.4 \pm 0.2$  and  $6.3 \pm 0.1\%$  and were higher than the control values at ( $P < 0.001$ ).

The ash level in the carp body was significantly ( $P < 0.01$ ) higher than in Control group; Test P-2 was about 1.1% and Test P-1 about 0.8% (Table 3).

On completing the second feeding stage, the moisture content in the body of the Test individuals was 74.3–74.9%, while the moisture content of the control ones was 79.5%, significant difference ( $P < 0.01$ ). The protein content in the body of a two-year-old individual in all variants almost did not differ and was from 15.1 to 17.2%. In P-1 and P-2 groups, the fat content was significantly ( $P < 0.05$ – $0.01$ ) higher than in Control group by 53% and 54%, respectively. Depending on the amount of probiotics in the diet, the content of ash elements in the body was significantly ( $P < 0.001$ ) lower by 6.3% (P-1) - 13.2% (P-2) compared with the control values (Table 4).

The second stage of growing clearly showed that the most beneficial effect on the accumulation of various organic substances in the carp body was provided by the Bacell-M additive in the amount of 0.03% of feed.

**Table 1 – The experimental scheme**

Group	Number of fish	Diet
P-0 – control Pond 13	285 pcs/ha	MPW
P-1 – Test 1 Pond 6	285 pcs/ha	MPW + 2 kg of probiotic “Bacell-M” for 1 ton of feed
P-2 – Test 2 Pond 11	285 pcs/ha	MPW + 3 kg of probiotic “Bacell-M” for 1 ton of feed

**Table 2 – The experiment results**

Parameters	Control (P-0)	Test (P-1)	Test (P-2)
Weight, g: initial	950±25	1005±40	970±38
resulted	1125± 55	1232± 72	1205± 81
Growth rate, g/day	5.8	7.56	7.8
Survival rate, %	82.6	94.2	95.1

**Table 3 – The chemical composition of the carp body (Stage 1)**

Test variants	Moisture, %	Content, %		
		protein	fat	ash
P-2	76.5±1.3	16.1±0.9	6.4±0.2	1.1±0.02
P-1	77.2±2.5	15.8±0.6	6.3±0.1	0.8±0.01
Control P-0	80.2±1.6	15.0±0.4	4.4±0.3	0.5±0.01

**Table 4 – The chemical composition of the carp body (Stage 2)**

Test variants	Moisture, %	Absolutely dry matter, %		
		protein	fat	ash
P-2	74.3 ± 1.1	17.2± 0.8	7.5 ± 0.3	1.2 ± 0.01
P-1	74.9 ± 2.5	16.8 ± 0.4	7.6 ± 0.2	1.1 ± 0.02
Control P-0	79.5 ± 1.4	15.1 ± 0.5	5.0 ± 0.4	0.7 ± 0.02

### CONCLUSIONS

The feed additive “Bacell-M” in the ration composition of the carp stimulated the processes in the body of fish and allowed increasing the average daily gain, simultaneously increasing the survival rate of the Test individuals and improving the qualitative composition of carp.

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