Researches Regarding the Combined Fodder Additives (Bio-Mos+Nupro+Selplex) Effects on the Productive Performances and Health of Rainbow Trout (Oncorhynchus Mykiss W.)

Aurel Sara, Aurelian Barbu, Erol Gabor, Mihai Benţea

University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, 400372, 3-5 Manastur Street,, Romania

Abstract

The trial had been carried out during 5 May–30 September 2009, (23 weeks) at the trout farm ICAS Gilau, Cluj County. Two groups were implied: a Control group and one experimental group (Bio-Mos0.2%+SelPlex0.03%+NuPro2%) each consisting of 250 rainbow trout juveniles. The experimental group received 0.2 % Bio-Mos+0.03% SelPlex+2%NuPro. At the end fish reached an average weight of 253.20 g/specimen for experimental group and 241.10 g/specimen for the Control group. The growth rate incresed by 5.23 % at the experimental group comparative with the Control group. The highest value of specific growth rate was recorded at group E, 1.51 g/day, with 5.59 % higher than the specific growth rate of the Controls. The addition of combined fodder additives in group E feed led to an abatement of the feed conversion rate (1.39:1) by 2.12 % smaller comparative with the Control group (1.42:1). The analysis of indices regarding the fish health and survival rate, showed the positive effects of the combined additives. At intestinal level it was noticed an increasement of villi lenght at group E with 10.72 % higher comparative with the Control group. A significant improvement of selenium content of rainbow trout meat was also noticed.

Keywords: combined fodder additives, meat quality, productive performances, rainbow trout.

1. Introduction

To improve the fodder value, one can add in its structure different fodder additives to allow the improvement of the main production indices of the cultured species. The researches made regarding the use of prebiotics, proteic extracts and organic minerals in fish nutrition reported that all those substances have a positive impact on productive performances and health of the species that have been studied [1, 2, 3].

The aim of this study was to follow the combined effect of the prebiotic Bio-Mos 0.2 % + organic mineral SelPlex 0.03 % + proteic extract NuPro 2 % on the rainbow trout (*Oncorhynchus mykiss W.)* growth and consumption indices, hematological indices and on the meat quality as well as to pinpoint the effect of Bio-Mos at intestinal level.

2. Materials and methods

The experiment had been carried out during 5 May–30 September 2009, (23 weeks) at the trout farm ICAS Gilau, situated in Cluj County. Two groups were implied: a Control group and one experimental group (Bio-Mos 0.2 %+ SelPlex 0.03 %+ NuPro 2%) each of them consisting of 250 rainbow trout juveniles. The experiment took place in two concrete tanks which offered the same rearing conditions (the same water quality, rearing density, feeding hours, food quantity). The experimental group received 0.2 % Bio-Mos + 0.03% SelPlex + 2% NuPro. At the begginig of this experiment the

* Corresponding author: Aurel Şara, Tel 0749021648, Email: asara50@yahoo.com

rainbow trout juveniles had an average body weight of 10 g/fish.

The fodder used was granulated fodder (Skretting, 41% CP) with the addition of 0.2 % Bio-Mos + 0.03 % SelPlex + 2 % NuPro for the experimental group. Both groups received two meals per day, at 8.30 am and 5 pm.

Table 1. Rainbow trout fodder nutritional characteristics

Issue	U.M.	Value
Crude protein	%	41
Crude fat	%	12
Ash	%	7,8
Cellulose	%	2,5
Phosphor	%	1,1
Copper	mg	6
Vit. A	U.I.	10 000
Vit. D3	U.I.	1 250
Vit. E	mg	150

The haematological investigations, based on known methods [4], included microhaematocrit, haemoglobin, total count of erythrocytes and blood morphological exam on MGG blood smears. The chemical composition of meat, based on known methods [5] followed CP content, Humidity, Fat and Dry Matter content. The Selenium content of rainbow trout meat was determined through SAA-HVG method with Shimadzu AAS-6300 spectrophotometer. For the histopathological exam two intestine samples were took from 2 and 8 cm from the stomach. The tissue samples (intestinal mucosa) were kept in 10 % formol, pH 7 for 24 hours, than the samples had been proccesed with Leica RM 2125 RT microtome and HE coloured and than the samples were examed with Olympus BX 51 microscope. The images were taken with Olympus SP 350 digital camera and analysed with Olympus DP soft.

The experimental data had been analyzed with GraphPad Instat 3 and the meaning of the differences between groups was established using Tukey-Kramer multiple comparissons test.

3. Results and discussion

The aim of the addition of the fodder addititves in the combined granulated fodder was to obtain superior bioproductive indices at the experimental group.

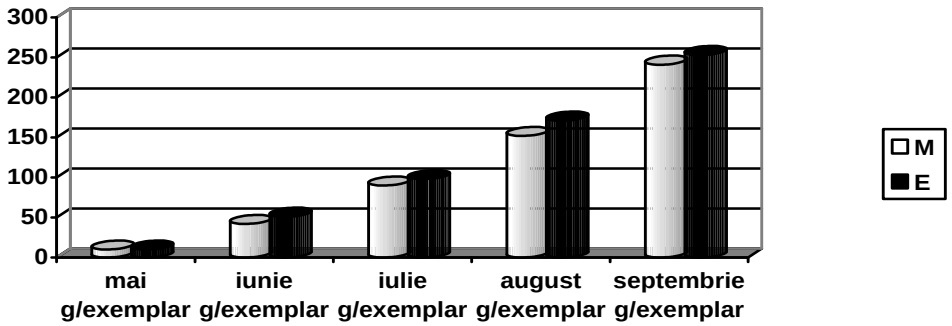

Figure 1. The rainbow trout body weight evolution during the trial

Analyzing the body weight evolution chart during the trial it can be seen that the introduction of Bio-Mos, NuPro and SelPlex in the combined granulated fodder structure had a positive influence on the growth dynamic of rainbow trout, fact reported by other reserchers too [1, 3, 6]. At the end of the trial, the experimental group had an average body weight of 253.20 g with 4.81 % higher than the final average body weught of the Control group (241.10 g).

To have a realistic apraisal of the growth dynamic of rainbow trout, at the end of the trial was determined the growth rhytm (final body weight – initial body weight) and the specific growth rate (g/day) this one bing the main indicator of the biomass acumulation rhytm assessment. Analyzing the main production indices recorded during the trial it can be seen the favourable influence of the fodder additives administered in rainbow trout feed, Bio-Mos 0.2 %, SelPlex 0.03 % and NuPro 2 % on the growth rate. The growth

rate incresed by 5.23 % at the experimental group comparative with the Control group (243.2o g at Analyzing the specific growth rate it can be noticed that the highest value was recorded at group E, 1.51 g/day, with 5.59 % higher than the specific growth rate of the Controls.

Analyzing the feed conversion rate one can see that its values are characteristic to the values recorded at trout. The addition of fodder additives in group E feed led to an abatement of the feed conversion rate (1.39:1) by 2.12 % smaller comparative with the Control group (1.42:1). This abatement of the feed conversion rate as a response to fodder additives incorporation in the basal diet of fish was reported also by other researchers [2, 7, 8].

group E vs 231.10 g value recorded at the Control group).

Table 2. The growth and consumption indices values at the end of the trial at rainbow trout

Issue	**U.M.**	**Control group**	**Experimental group (Bio-Mos 0.2%+ NuPro 2%+ SelPlex 0.03%)**
Growth rate	g	231.1	243.2
	%	100	105.23
Specific growth rate	g/day	1.43	1.51
	%	100	105.59
FCR (feed conversion rate)	kg fodder/kg body weight	1.42:1	1.39:1

Analyzing the feed conversion rate one can see that its values are characteristic to the values recorded at trout. The addition of fodder additives in group E feed led to an abatement of the feed conversion rate (1.39:1) by 2.12 % smaller comparative with the Control group (1.42:1). This abatement of the feed conversion rate as a response to fodder additives incorporation in the basal diet of fish was reported also by other researchers [2, 7, 8].

Due to the fact that Bio-Mos fulfills different roles in fish oragnism (eliminates the pathogens from the intestinal level and through its constitution of oligosaccharid it offers energetical support for enterhocyres development) and to explain the superior growth rhytm of the experimental group, there were made some histological investigations at intestinal level. The investigations consisted in the measurement of the villi and microvilli lenght, both of them being responsible with nutrient absorbtion.

Table 3. The villi and microvilli lenght (μm) values of rainbow trout**.**

Issue	Control group	Experimental group
Villi lenght		
n	57	46
$\bar{X}\pm S\bar{x}$	422.69±12.68	468.02±19.48^{x}
v %	22.65	28.24
Microvilli lenght		
n	69	38
$\bar{X}\pm S\bar{x}$	3.20±0.10	3.83±0.44^{xx}
v %	25.93	22.71

x - P<0.05 xx - P<0.01

From the values presented in the table above it can be seen the favourable influence of Bio-Mos at intestinal level, noticing an increasement of the villi lenght at group E with 10.72 % higher comparative with the Control group. This development of the villi structures (reported also by other researchers [9] at rainbow trout), determined the enlargement of the nutrient absorbtion area, fact that explains the superior growth rhytm of the group. Also it can be observed a slightly increasement of the microvilli lenght with 19.68 % higher than the Controls as a

result of enetrocytes stimulation with mannanoligosaccharids. This stimulation determined a uniformization of the microvilli brush border and an increased lenght of them which explains the superior growth rhytm of the experimental rainbow trouts.

Among the body indices and the growth rhytm dynamic it was also followed the chemical composition of rainbow trout meat.

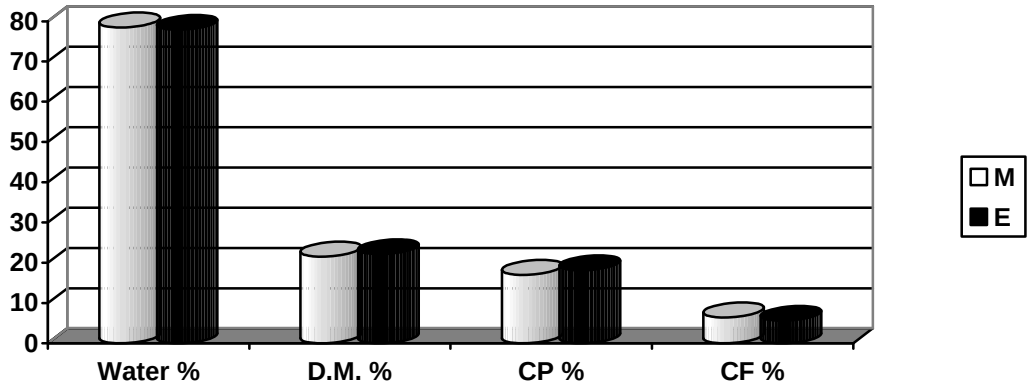

Figure. 2. The chemical composition of rainbow trout meat

From the data presented in the chart above it can be seen that the combined addition of Bio-Mos, NuPro and SelPlex in rainbow trout feed did not have a major impact on the chemical composition of its meat, the differences recorded being insignificant. The values obtained are similar with the ones given in the literature [10, 11]. It can be seen a slight increasement of the protein content of meat at group E 18.14 % CP with 2.69 % higher than the one recorded at Control group.

From the data presented in the table below it can be seen a very significant improvement of selenium content of rainbow trout meat as a response to rainbow trout diet supplimentation with organic selenium in form of SelPlex.

Table 4. The rainbow trout meat Selenium content (μgSe/kg meat).

Issue	Control group	Experimental group
n	5	5
$\bar{X} \pm S\bar{x}$	51.63 ± 2.46	219.78 ± 7.35^{xxx}

xxx – P < 0.001

Table 5. The survival percent and the losses recorded during the trial**.**

Issue	**Control group**	**Experimental group (Bio-Mos 0.2% + SelPlex 0.03% + NuPro 2%)**
Initial fish number	250	250
Final fish number	209	217
Survival (%)	83.6	86.8
Losses (%)	16.4	13.2

Analyzing the values from the table above it can be seen an improvement of the survival rate at the experimental group, an improvement of 3.2 %. This improvement of the survival rate is due to the presence of mannanoligosaccharids that stop the colonization of the intestine with pathogens and to the presence of Selenium which stops the radicalic reactions. This improvement of the survival rate shows the benefical effect of the fodder additives that have been incorporated in rainbow trout diet. The hematological investigations followed the corelation of some erythrocitary and leucocitary

indices needed to elaborate a hematological pattern to evaluate the health of the fish through the cuantification of the toatl erythrocytes and leucocytes nomber and erythrocytes/leucocytes and lymphocytes/granulocytes ratio.

Table 6. Comparative average values between the two groups

Issue	Average values of Control group		Average values of Experimental group	
	Nr.	%	Nr.	%
Erythrocytes (total)	541.2	96.94	528.3	96.94
Leucocytes (total)	17.4	3.02	16.6	3.02
Neutrophils	1.8	0.12	0.6	0.12
Lymphocytes	15	2.79	15.16	2.79
Monocytes	3	0.23	0.5	0.23
Total Erythrocytes+Leucocytes	558.6	99.98	544.6	99.98
Erythrocytes/leucocytes	31.1/1	96.72/3.12	31.8/ 1	96.95/3.04
Lymphocytes/granulocytes	8.3/1	89.27/10.75	22.75/1	95.05/4.9

The values obtained are in the normal range revealing a good level of welfare and health of the rainbow trouts. The corelation of those indices with the improvement of the growth rhytm indices and the survival rate show the positive biological effects of the used fodder additives.

4. Conclusions

• Through the combined use of prebiotic Bio-Mos 0.2 %, proetic extract NuPro 2 % and organic mineral SelPlex 0.03 % in rainbow trout feed had been showed their biostimulating effects exprimated through the improvement of rainbow trout main bioproductive performances and health indices.

▪ The growth rate and the specific growth rate showed an improvement by 5.23 % respectiv 5.59 % at group E comparative with the Control group

▪ Regarding the survival rate it has been noticed the positive effect of the fodder additives that have been incroporated in rainbow trout feed. At the Experimental group it was recorded the highest survival rate, 86.8 %, with 3.2 % higher than the Control group survival rate.

▪ The benefical biological effects of the fodder additives that have been incorporated in the basal diet of brook trout are exprimated through the annealing of leucogramme and the abatement of losses recorded

▪ The addition of Bio-Mos, NuPro and SelPlex in rainbow trout feed did not have a major impact on the chemical composition of its meat. It was observed a slight increasement of the protein content of meat at the Experimental group 18.14 % CP comparative with 17.02 % at Control group. Regarding the meat Selenium content, it was noticed a very significant improvement of the selenium content of rainbow trout meat (219.78 Se µg/kg at the Experimental group comparative with 51.63 Se µg/kg value recorded at the Control group) as a response to rainbow trout diet supplimentation with organic selenium in form of SelPlex.

▪ Regarding the histological indices, it was noticed an increasement of the villi lenght at group E with 10.72 % higher comparative with the Control group (468.02 µm at group E vs 422.69 µm at Control group). Regarding the brook trout microvilli lenght it has increased from 3.20 at 3.83 µm at group E, as a result of enetrocytes stimulation with mannanoligosaccharids. This development of the villi and microvilli structures reported also by Sweetman et all., 2008 at rainbow trout, determined the enlargement of the nutrient absorbtion area, fact that explains the superior growth rhytm of the treated group.

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