The Influence of Some Fodder Additives on the Growth Indices and Survival Rate of Common Carp (*Cyprinus carpio L.*) and Grass Carp (*Ctenopharyngodon idella L.*) Juveniles

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Abstract

The goal of this research was to evaluate the effects of some additives in common carp (*Cyprinus carpio*) and grass carp (*Ctenopharyngodon idella*) feeds on the growth indices and survival rate. Experimental period was 122 days for common carp and 115 days for grass carp in Martineşti farm, Cluj County. Four groups were implied: LM-control group; L1E-group (Allzyme®SSF); L2E-group (Bio-Mos®); L3E-group (Allzyme®SSF plus Bio-Mos®), 50 common carp Lausitz var., 50 Galitian var., 50 grass carp juveniles/group. The initial body weight was 1.6g/specimen for common carp and 2.6g/specimen for grass carp. The best results regarding the growth indices for Galitian var. were recorded at group L2E (263±6.84g/specimen body weight) comparative with Control group(241±5.18g). The best survival rate was registered at group L3E (96%). Regarding Lausitz var. the best growth performances were noticed at group L2E 305±12.93g/specimen. The best survival rate was noticed at groups L1E, L3E with 94% comparative with Control group (287±3.69g/specimen body weight, 90% survival rate). For the grass carp the best results were recorded at group L3E (134±2.66g/specimen body weight, 90% survival rate) compared with Control group(120±5.09g/specimen body weight, 84% survival rate). These results show that supplementation of common carp and grass carp feeds with Allzyme®SSF and Bio-Mos led to a better growth and survival rate.

Keywords: Allzyme SSF, Bio-Mos, common carp, enzymatic complex, grass carp, growth rate

1. Introduction

The use of enzymes in feeds for aquaculture presents a great potential to reduce the costs and to improve the fish growth performances. The introduction of enzymatic complex Allzyme SSF prior pelleting enhances the digestibility of carbohydrates, phosphates and soluble nitrogen [1]. The best results after adding Allzyme® SSF in Pangasius feed were obtained with feeds wich had a reduced fish meal content [2]. After administrating Allzyme® SSF for a period of 56 days to Nile tilapia, Filer [3] obtained a better body weight at experimentals groups compared with the Control group. Other research with positive results involving the introduction of exogenous enzymes in feeds for carp were realised by Sardar et al. [4] who demonstrated that the supplementation with phytase can reduce the supplementary doses of dicalcic phosphorus , microminerals, lysine and methionine needed in feed. Nwanna et al. [5] obtained a bigger dose of minerals in the organism and a decrease of phosphorus eliminated in water after the supplementation of fodder with phytase. Bio-Mos is a mannanoligosacharide derived from the outer cell wall of *Saccharomyces cerevisiae* 1062 culture of Alltech Inc. USA. The effects of Bio-Mos® are well documented in farm animals rearing, and recently it was also introduced in fish nutrition [6]. The positive influence of Bio-Mos® on growth indices of common carp were pointed by the research of Staykov [7] and Culjak[8]. Bio-Mos®

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acts at intestinal level where it realises links with a series of bacteria preventing their installation to the intestine.

The purpose of this research was to evaluate the effects of enzymatic complex Allzyme® SSF and prebiotic Bio-Mos® in different combinations on the production indices and survival rate of common carp and grass carp juveniles.

2. Materials and methods

The experiment had been carried out at Martinesti fish farm, Cluj County, from 03.july.2009 until 03.november. 2009. Four groups were implied: LM-control group, L1E-Allzyme® SSF, L2E-Bio-Mos®, L3E-Bio-Mos® plus Allzyme® SSF. Each group was made from 50 common carp Lausitz var., 50 common carp Galitian var. and 50 grass carp juveniles. The carps were introduced in compartments in 03.july.2009 having an average weight of 1.6g/specimen for both common carp varieties. The grass carp was populated in 10.july. 2009 at an average weight of 2.6g/specimen. Each group was placed in one compartment of 150m^2 area.

Throughout the experimental period, the physical and chemical parameters of water were recorded. The characteristics of rearing compartments and the physical and chemical water parameters are listed in table 1.

Table 1: Main characteristics of the rearing compartments and water

Parameter	UM	Value
Average depth	m	1.2
Area	m^2	150
Medium temperature	ºC	20.8
Minimum temperature	ºC	29
Maximum temperature	ºC	13.7
Oxygen level	mg/l	7.1
Medium pH		7.9

The fodder used in the experiment had the following chemical composition: 38 % crude protein, 7 % crude fat, 4 % cellulose and 10 % humidity. The fodder was administered as granules of 3 mm diameter.

In the feed of experimental groups were added: L1E-0.02% Allzyme® SSF; L2E-0.2% Bio-Mos®; L3E- 0.02% Allzyme® SSF plus 0.2 % Bio-Mos®.

At the beginning of the experiment, fish were fed 3 times / day. The number of feedings was reduced with the increase of water temperature and fish growth. In the last part of the experiment fish were fed only once a day. The feeding program is listed in table 2.

Table 2: Fodder administration programme and the fodder quantity % from daily ratio

Feeding period	Feeding hour	The given percentage from daily ratio %
03.07.2009 – 12.08.2009	8 ^{oo}	30
	13 ^{oo}	40
	18 ^{oo}	30
13.08.2009 – 15.10.2009	8 ^{oo}	40
	18 ^{oo}	60
15.10.2009 – 03.11.2009	18^{oo}	100

The measurements and weightings made during the experimental period helped us to determine the growth rate and the most important biometrical indices. At the end of the experimental period was determined the survival rate for each group. All data were analyzed with ANOVA method.

3. Results and discussion

The results regarding the body weight of both common carp varieties are listed in table 3.

As it shows, in the case of Lausitz var. the best results regarding the body weight were noticed at group L2E (Bio-Mos®), 305±12.93 g/specimen. The smallest value was recorded at the Control group LM (287±3.69 g). In the case of Galitian var., group L2E (Bio-Mos®) registered a medium body weight of 263± 6.84g/ specimen compared with the Control group LM (241±5.18g). Those results confirm the results reported by Staykov[7] and Culjak[8] at common carp, although our results don't have the same relevance.

In table 4 there are listed the medium values of some body indices and growth rate of juvenile common carp at the end of experimental period. The main biometric indices of juvenile common carp are presented in table 4.

Tabel 3: Evolution of body weight of juvenile common carp throughout the experimental period

Group		Average body weight (g)							
		n	03.07.2009	n	28.07.2009	n	12.08.2009	n	03.11.2009
Lausitz Carp	LM	50	1.6±0.007	20	39.26±1.78	20	86.72±2.83	45	287±3.69
	L1E	50	1.6±0.007	20	44.72±1.48	20	92.07±4.58	47	300±8.74
	L2E	50	1.6±0.007	20	44.91±1.64	20	88.41±7.49	46	305±12.93
	L3E	50	1.6±0.007	20	41.4±3.08	20	99.27±8.43	47	304±7.07
Galitian Carp	LM	50	1.6±0.008	20	34.3±1.75	20	45.7±2.01	44	241±5.18
	L1E	50	1.6±0.008	20	35.2±1.95	20	47.91±1.88	47	259±6.38
	L2E	50	1.6±0.008	20	35.5±1.73	20	48.8±2.62	47	263±6.84
	L3E	50	1.6±0.008	20	34.37±1.55	20	50±2.83	48	262±6.66

Table 4: The main biometric indices of common carp juveniles at the end of experimental period

Variety	Parameter	LM	L1E	L2E	L3E
Lausitz Carp	Medium Weight(g)	287±3.694	300±8.742	305±12.931	304±7.074
	Medium total length (cm)	22.9±0.15	23.3±0.27	24.05±0.35	23.5±0.37
	Medium edible length(cm)	13.68±0.03	13.95±0.86	14.00±0.21	14.03±0.15
	Daily growth rate (g)	2.34	2.45	2.49	2.48
Galitian Carp	Medium Weight (g)	241±5.18	259±6.37	263±6.83	262±6.65
	Medium total length (cm)	21.59±0.11	21.24±0.28	22.50±0.34	22.92±0.22
	Medium edible length(cm)	13.43±0.04	13.50±0.07	13.55±0.03	13.52±0.16
	Daily growth rate (g)	1.96	2.11	2.14	2.13

Regarding the body mass evolution of grass carp, the best results were noticed at group L2E (Bio-Mos®) 134±2.66. A close value was registered at the experimental group L3E (Allzyme® SSF plus Bio-Mos®). The Control group registered a medium body weight of 120±5.81g/specimen (table 5 and table 6).

Table 5: Evolution of body weight of grass carp juveniles throughout the experimental period

Group		Medium body weight (g)							
		n	10.07.2009	n	28.07.2009	n	12.08.2009	n	03.11.2009
Grass Carp	LM	50	2.6±0.005	20	14.33±1.00	20	35.3±2.47	42	120±5.81
	L1E	50	2.6±0.005	20	14.62±1.20	20	37.71±1.94	42	130±4.80
	L2E	50	2.6±0.005	20	14.46±1.01	20	36.36±1.55	44	134±3.04
	L3E	50	2.6±0.005	20	14.5±2.22	20	39.9±1.16	45	134±2.66

Table 6: The main biometric indices of grass carp juveniles at the end of experimental period

	Parameter	LM	L1E	L2E	L3E
Grass Carp	Medium Weight (g)	120±5.08	130±4.80	134±3.04	134±2.58
	Medium total length (cm)	20.63±0.23	21.56±0.31	21.63±0.24	21.56±0.20
	Medium edible length (cm)	12.55±0.08	13.03±0.16	13.20±0.14	13.7±0.13
	Daily growth rate (g)	1.02	1.11	1.14	1.14

The supplementation of feeds with enzymatic complex Allzyme® SSF has enhanced the growth rate of common carp (table 3 and table 4) and grass carp (table 5 and table 6). Those data have the same evolution as the ones reported at Pangasius [2] and Nile tilapia [3]. The survival rate and losses percentages throughout the experimental period are listed in table 7 for both carp varieties and grass carp. At the end of the experimental period the best survival rate for Lausitz var. was recorded at experimental group L3E (Allzyme® SSF plus Bio-Mos®) (94%) comparative with the Control group LM (90%). In the case of Galitian var. the best survival rate was recorded at group L3E (Allzyme® SSF plus Bio-Mos®) (96%) comparative with the Control group LM (88%). Regarding the survival rate of grass carp, the best results were recorded at group L3E (Allzyme® SSF plus Bio-Mos®)(90%) omparative

with the Control group LM (84%) and experimental group L1E (Allzyme® SSF) (84%).

Table 7: Survival rate at the end of experimental period

	Group	Initial number	Final number	Survival (%)	Losses (%)
Lausitz Carp	LM	50	45	90	10
	L1E	50	47	94	6
	L2E	50	46	92	8
	L3E	50	47	94	6
Galiţian Carp	LM	50	44	88	12
	L1E	50	47	94	6
	L2E	50	47	94	6
	L3E	50	48	96	4
Grass Carp	LM	50	42	84	16
	L1E	50	42	84	16
	L2E	50	44	88	12
	L3E	50	45	90	10

4. Conclusions

1. The addition of enzymatic complex Allzyme® SSF and prebiotic Bio-Mos® in feeds of common carp (Lausitz and Galitian var.) juveniles and grass carp juveniles
determined the enhancement of the main production indices and survival rate.
2. The addition of Bio-Mos® in common carp juveniles Lausitz var. fodder determined an increase of the body weight with 6.28% comparative with the Control group.
3. The addition of Bio-Mos® combined with Allzyme® SSF in common carp juveniles Galitian var. fodder led to an increased survival rate of experimental group L3E with 8% higher than the Control group survival rate.
4. Regarding the grass carp, the addition of Bio-Mos® combined with Allzyme® SSF in feed for juveniles had positive effects, increasing the body weight with 11.6% for experimental group and the survival rate with 6% comparative with the Control group.

References

1. Filer K., Nattawade Jantasilia, Navaporn Chauynarong, Influence of Allzyme® SSF on the digestion of aquaculture feed ingredients prior to pelleting, Nutritional Biotechnology in the Feed and Food Industries Proceedings of Alltech's Twenty Third Annual Symposium,2007, Edited by TP Lyons, KA Jacques and JM Hower
2. World Aquaculture 2008 – Meeting Abstract: https://www.was.org/Meetings/AbstractData.asp?AbstractId=16100
3. Filer K., Ben L. Schafer, Steven R. Craig, Brian Hoskins and James L. Pierce, Effects of Allzyme® SSF on the Growth Performance of Nile Tilapia, Aquaculture 2010 - Meeting Abstract, Aquaculture 2010 San Diego, California, Feeds/Nutrition Posters,: https://www.was.org/WasMeetings/meetings/SessionsByDay.aspx?Code=AQ2010
4. Sardar, P.; Randhawa, H.S.; Abid, M.; Prabhakar, S.K, Effect of dietary microbial phytase supplementation on growth performance, nutrient utilization, body compositions and haemato-biochemical profiles of Cyprinus carpio (L.) fingerlings fed soyprotein-based diet, Aquaculture Nutrition, 2007, 13, 6, 444-456, December 2007
5. Nwanna L. C., M. Kolahsa, R. Eisenreich and F. J. Schwarz- Pre-treatment of dietary plant feedstuffs with phytase and its effect on grtale inowth and mineral concentration in common carp (Cyprinus carpio L.), Journal of Animal Physiology and Animal Nutrition,2008, 92, 6, 677 – 682
6. Sweetman J., S. Davies, Improving growth performance and health status of aquaculture stocks in Europe through the use of Bio-Mos® ,Nutritional biotechnology in the feed and food industries: Proceedings of Alltech's 22nd Annual Symposium, Lexington, Kentucky, USA, 2006, 445-452
7. Staykov, Y. The influence of Bio-Mos® on growth rate and immune status of common carp (Cyprinus carpio). In: Alltech's 2nd Annual Aquaculture meeting. 2004, Dunboyne, Co. Meath, Ireland, November
8. Culjak V, Bogut G, Has-Schon E, Milakovic Z and Canecki K, Effect of Bio-Mos® on performance and health of juvenile carp. In: Nutrition and Biotechnology in the Feed and Food Industries: Alltech's 22nd Annual Symposium,2006, (Suppl. 1 - Abstracts of posters presented) Lexington, KY, US