ОТГЛЕЖДАНЕТО НА ШАРАН (*CYPRINUS CARPIO*) В ПОЛИКУЛТУРА С БЯЛ АМУР (*CTENOPHARYNGODON IDELLA*) – УСЛОВИЕ ЗА ЕФЕКТИВНО ПРОИЗВОДСТВО
THE CARP (*CYPRINUS CARPIO*) REARING IN POLYCULTURE WITH GRASS CARP (*CTENOPHARYNGODON IDELLA*) – A CONDITION FOR FARMING EFFICIENCY

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Резюме

Изследването се базира на използването на естествения трофичен капацитет на рибовъдни басейни при отглеждане на различни шаранови риби (Cyprinidae). Изследването е проведено с 3 групи шаран (*Cyprinus carpio)* и с бял амур (*Ctenopharyngodon idella*). Използвани са различни режими на хранене. Най-добри резултати са получени при подхранване на шарана с концентриран фураж, с разчет 9,6 g на глава. *Ctenopharyngodon idella* е предпочитал тръстиката пред подхранването с детелина, като потреблението е било 109,1 g на глава. Рибата, хранена с комбиниран фураж, е показала най-добри резултати по отношение на угоителната способност (4,8 пункта), а при хранене с детелина, внесена в басейна – 3,6 пункта. *Ctenopharyngodon idella* е реализирал угоително ниво 4,2 пункта. В заключение може да се посочи, че двата вида може да се отглеждат успешно в поликултура за използване на растителността в басейните с обрастване.

Abstract

The study aimed to use the natural trophic capacity of fish ponds using different Cyprinids species. Biological material consisted of 3 groups of *Cyprinus carpio* and *Ctenopharyngodon idella*. The achieved results showed that the groups fed differently obtained also different growth performances. The best results were obtained when the *Cyprinus carpio* was fed with concentrate feed, the consumption was 9.6 g/ capita. Ctenopharyngodon idella preferred the reed instead of mowing clover, the consumption was 109.1 g/ capita. The fish fed with combined feed realised the best results regarding fattening level (4.8 points) and those fed with mowing clover administered to the pond obtained 3.6 points. The *Ctenopharyngodon idella* realised a fattening level of 4.2 points. It may be concluded that the two species can be reared in polyculture succeeding to exploit the aquatic vegetation from the pools where the vegetation exists.

Ключови думи: риба**,** *Cyprinus carpio*, *Ctenopharyngodon idella*, поликултура, ферма.
Key words: fish**,** *Cyprinus carpio*, *Ctenopharyngodon idella*, polyculture, farm.

INTRODUCTION

Cyprinids breeding have a special importance due to the large number of carp species that use various trophic resources turning them into meat. Phytoplankton and zooplankton cyprinids species feed with aquatic plants and organisms that cannot be used by humans. Those food resources are used and transformed into meat by the mentioned species for human consumption. The aquatic macroflora is a problem to farmers when it is in excess but grass carp is a fish that turns it into meat, being easy digestible for those species. Due to a large variety of consumed trophic resources, the cyprinids may be grown in polyculture, representing an inexpensive and accessible technology. This study aimed in determining the influence of supplementary feeding of carp grew in polyculture with grass carp, in condition of increased density per unit area. In an intensive pisciculture, the supplementary feeding is the only way to ensure a stable trophic basis. Grass carp grew in polyculture with common carp has as result a better aquatic macroflora utilisation. In this research, the aquatic macroflora was used as a modality to feed the fish and to increase the production per unit area. (Bud et al., 2004;

Bura, 2005; Halga et al., 2000; **O**prea and Georgescu, 2000; Nicolae, 2008).

MATERIALS AND METHODS

Aquatic farms have to ensure the capitalization of all trophic levels in order to increase the efficiency of this sector. This research carried out on two species of carp *Cyprinus carpio* and *Ctenopharyngodon idella* aimed at highlighting the efficient use of natural food from the growing basins. Also, in order to ensure a stabile trophic basis to increase the fish density per surface unit, there was a feeding supplementation based on combined fodder.

The researches were carried out in a fish farm from Iaşi, Romania. This research was done on two years old carp and three years old *Ctenopharyngodon idella.* There were used submerged floating basins for a period of 56 days, from July to September.

The biological material was represented by 30 individuals distributed in 1 control group and 2 experimental groups. There was a different proportion of the two studied species in the groups.

The research was carried out according to the general schem (Fig. 1*).*

The control group was fed with mixed fodder. The E1 group was fed with mown Trifolium repens (green fodder) administrated on the water surface. The E2 group was fed with reed and combined fodder. The fodders were administrated once a day around 8 a.m.

Fish were individually measured and weighed periodically and the obtained data were statistically processed and interpreted. Based on body measurements were calculated the main body indexes.

The water physic- chemical parameters have been determined by usual methods and the results were compared with data from the literature.

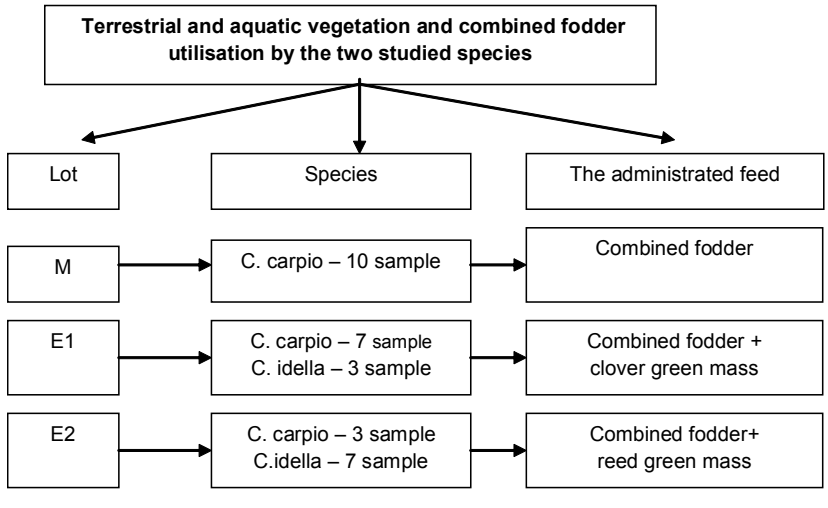
Collected data were subjected to statistical computation, using ANOVA single factor algorithm, to find out any significant differences.

RESULTS AND DISCUSSION

The water physico-chemical parameters were established to the beginning of the experiment and then once every 7 days, results being presented in table 1. The temperature varied between 18-25ºC, without influence on fodder consumption. The higher temperature values registered in the second part of August determined a lower feeding consumption compared with the other control periods. The other chemical parameters were in normal limits, including the nitrates and nitrites with no toxic effects on fish. The dissolved oxygen registered values closed to optimum, noticing a negative correlation between water temperature and oxygen. The water green color was caused by aquatic vegetation especially, of green algae. The water yellow-green color was determined by the results of partial decomposition of the phytoplankton. The water reduced transparency showed its richness in phytoplankton, zooplankton and in mineral and organic matter.

The fish body development was determined through body measurements and weight determination at various intervals of time; the obtained values are presented in table 2. Analysing the evolution of body measurements can be noticed that the studied species increased mainly in body length and then in thickness and width during the experiment.

The calculated body indexes are presented in the following table (table 3). The analysis of the body indexes allows us to do the following observations. The profile index shows that the grass carp has an almost straight profile compared with carp that has a convex upper line. The values of width index for the two species are similar with the ones presented by studied literature. The quality index shows a good maintenance.



Фиг. 1. *Генерална схема*
Fig. 1. *General scheme*

Table 1. Физико-химични параметри на водата
Table 1. Water physic-chemical parameters

Day	T° (C°)	pH	OM (mg/l)	Chlorides Хлориди (mg/l)	Ca (mg/l)	Mg (mg/l)	Phosphates Фосфати (mg/l)	Nitrate Нитрати (mg/l)	Nitrite Нитрити (mg/l)	O_2 (mg/l)	Water color Цвят на водата	Transparency Прозрачност (cm)
20.07.2012	20	7.1	48.20	11.31	35.24	18.50	0.29	0.30	0.05	5.2	Green /Зелена	15
27.07.2012	19	7.3	49.97	10.56	33.66	17.64	0.21	0.27	0.06	5.3	Green /Зелена	16
3.08.2012	18	7.5	52.27	12.57	36.79	18.31	0.39	0.21	0.06	5.8	Green /Зелена	15
10.08.2012	20	7	53.20	15.53	39.80	18.66	0.42	0.25	0.08	5.2	Green /Зелена	15.5
17.08.2012	22	6.9	55.60	13.29	37.81	17.53	0.41	0.24	0.07	5	Green /Зелена	16
27.08.2012	23	6.9	57.26	12.42	41.20	17.21	0.38	0.19	0.06	4.7	Yellow-green Жълто-зелена	18
31.08.2012	25	6.8	61.10	14.76	44.40	17.97	0.37	0.17	0.08	4.8	Yellow-green Жълто-зелена	18
3.09.2012	24	6.7	59.54	5.71	45.31	18.84	0.35	0.18	0.08	4.5	Yellow-green Жълто-зелена	18
Average Средно	21.3	7.02	54.64	13.28	39.28	18.08	0.35	0.22	0.06	5.06	-	16.43

Таблица 2. Телесни измервания на проучваните видове (Cyprinidae)
Table 2. Somatic measurements performed on studied Cyprinids species

Specification Показатели	*Ctenopharyngodon idella*								*Cyprinus carpio*							
	18.07.2012		31.07.2012		17.08.2012		5.09.2012		18.07.2012		31.07.2012		17.08.2012		5.09.2012	
	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min	max
Absolute body length	38.9	39.5	39.9	41.5	41.4	43	43	44.1	30.1	31.2	31	33	33	33.6	33.5	35.5
Standard body length	33.3	34.6	35	35.8	36.1	36.9	37	38.5	26.1	37.8	27	28.9	28.2	29.8	29	31
Head length	5.9	6.3	5.9	6.6	6.2	7	6	6.9	5.2	6	5.3	6	5.6	6.2	6	6.6
Weight	890	910	1000	1006	1120	1160	1320	1365	445	455	486	500	542	552	630	645

Таблица 3. Телесни индекси
Table 3. Body indexes values

No	Specification / Показатели	*Ctenopharyngodon idella*		*Cyprinus carpio*	
		Min	Max	Min	Max
1	Profile index	2,5	2,8	2,8	3,3
2	Width index	2,0	2,2	2,1	2,3
3	Quality index	1,0	1,2	1,5	1,6
4	Meat index	20,68	21,00	18,00	18,50

Таблица 4. Растежна способност и оползотворяване на фуража при експерименталните групи
Table 4. Growth and feed utilization process to the experimental groups

Specification Показатели	Control group Контролна група	E1 group/група	E2 group/група
Body weight to the experiment beginning	452	900	900
Body weight to the end of experiment	470	1269	1292
Total gain (g)	268	369	392
Total feed consumption (g)	9.6	82	109
DM content (%)	85.0	16.32	38.06
DM consumed (kg)	8.16	13.38	41.49
Consumption index	3.58	21.46	30.11

Таблица 5. Степен на угояване на проучваните групи
Table 5. Fattening level to the studied species

Group / Група	Minimum points Минимален бал	Maximum points Максимален бал	$\overline{X} \pm s_{\overline{X}}$	CV%
M	4,7	5,0	4,8±0,3	6,2
E1	4,4	4,9	4,6±0,5	10,8
E2	3,4	3,9	3,6±0,5	9,8

Regarding the feed utilisation process to all the experimental groups, the obtained data are presented in table 4. Analysing the data presented in the previous table is worth mentioning: The control group fed with combined fodder in proportion of 5% from fish weight obtained better results in terms of growth and from economical point of view. The E1 group fed with Trifolium repens performed intermediate growth performances between the other two groups (control and E2). The E2 group fed with reed in a 40% proportion from fish body weight achieved an appreciable performance in growth taking into account that the reed has a low nutritive content. The researches have shown that grass carp prefers macrophyte vegetation which is better utilised and transformed into meat than Trifolium repens. The consumption index to E2 group was higher due to the fact that the fodders were poor in nutrients.

To appreciate the fattening degree the fish from all the experimental groups were slaughtered and then evaluated based on points according to studied literature (table 5). Analysing the data from the table, it may be mentioned that the fish fed with mixed fodder obtained the best results in fattening, the index value being 4.8 points.

CONCLUSIONS

1. The experiment showed that notable results may be achieved when carp is breed in polyculture but the species grown together should not be in food competition.
2. The highest weight gain of the 3 experimental groups was performed by control lot (*Cyprinus carpio*) which valued better the mixed fodder.
3. The both lots of grass carp registered different weight gain, according to administrated fodders; better results were obtained by the group which was fed with clover green mass compared with the one fed with reed green mass.

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