Impact of poly culture on some productive traits of two species of carp fish (common carp *Cyprinus carpio* L. with grass carp *Ctenopharyngodon idella* reared in floating cages

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Abstract

This study was conducted to determine the effect of rearing common carp *Cyprinus carpio* L. with grass carp *Ctenopharyngodon idella*, as a poly culture on some productive traits, were reared according to the floating cage system. Three treatments were used; T1: 20 common carp fish were used, T2: 20 grass carp fish were used, T3: 10 common carp fish and 10 grass carp fish were used. By 6 floating cages of 4 m^3 in size, made of galvanized iron, were prepared.The best productive traits were in T3, in which common carp and grass carp were put in poly culture . We conclude from this study that the poly culture of common carp with grass carp achieves the best production traits.

Keywords: Poly culture, productive traits, common carp, grass carp, floating cages.

Introduction

Fish meat contains approximately 18% of animal protein, which made the nutritional value of fish meat no less important than other sources (Al-Bahadli, 2011). The meat of other animals constitutes about 40% of the animal protein, while fish alone provides 24% of animal protein, that is why fish has become one of the most important sources of protein (Alagawany, 2021).

The increase in health and cultural awareness has led to an increased demand for safe and healthy foods, this increased the demand for animal protein, especially that of fish meat, because of its importance in maintaining the general health of the body (Hua*et al*., 2019).

Abu Al-Hani(2014)showed that fats and essential amino acids, such as methionine and lysine, the most important contents of fish meat,

as well as it contains of phosphorus, iron, zinc and unsaturated fatty acids, which made its meat to be nutritionally balanced meat.The population has increased rapidly in recent times, which made interest in fish farming projects an urgent necessity to fill the food shortage (Davies and Gonveia, 2006).

Olubunmi (2009) indicated that floating cages are one of the most important methods of cage farming in recent times, this method has several advantages, the most important of which are low costs, optimal water utilization, and ease of disease treatment and control.The common carp (*Cyprinus carpio*) and the grass carp (*Ctenopharyngodon idella*) are among the most important fish of the carp family, which is characterized by ease of cultivation, high resistance to weather fluctuations, rapid growth, and consumer acceptance of it (Thiab, 2019).

Al-Salman(1990)confirmed that the rearing of several species of fish in the same pond has many advantages, the most important of these is full occupancy of the water column and good food availability, by the lack of competition for food between rearing species, because each of them depends on a specific type of food that differs from the food of the other type, this allows access to sufficient quantities of food for all rearing species.Salman *et al*.(1997) mentioned that the rearing of several species of carp fish is very important, there is a mutually beneficial relationship between the various species of carp fish.

The current study aims to demonstrate the effect of rearing common carp and grass carp together as a poly culture on some productive traits.

Materials and Methods:

The study was conducted on the banks of the Euphrates River at the city of Samawah, a total of 6 floating cages were used with dimensions of 3 m long x 3 m wide x 2 m high.The cages area is located on the left side of the river (Al-Sayagh area).

The cages were equipped with nets on the sides, the size of the eye (20 mm).The mechanical feeders were installed on the cages, which were made of galvanized iron, which were used to feed fish.

The fish were brought and distributed in cages with (20) fish per cage, for each treatment, two replicates. A total of 120 fishes were used, were distributed ti three treatments; T1: 20 common carp fish were used, T2: 20 grass carp fish were used, T3: 10 common carp fish and 10 grass carp fish were used.Fish weights ranged 24-25 gm.

The cages were cleaned of waste and dirt surrounding them, which comes running with the waters of the river, ensure the natural movement of fish and check the nets constantly and ensure their safety.A number of at least 50% of the basic number of fish is extracted, a weight measurement was taken for each cage, and the weight measurement process was done every 30 days, oxygen concentration, temperature, pH and salinity were measured every week.

The experiment lasted for (3) months, from 1/9/2022 to 1/12/2022.

The data were analyzed statistically using the SPSS statistical software, completely randomized design and Duncan's (1955) test was used to compare the means for the treatments.

Table (1) Components of the experimental diet.

Items	Percent
Fishmeal (protein concentration)	25.00
Soybean meal	10.00
Maize	15.00
Wheat bran	20.00
Barley	30.00

Table (2) Chemical analysis of the experimental diet

Contents	Percent (%)
Protein	28.13
Fat	3.40
Ash	8.20
Fiber	4.62
Humidity	8.31
Carbohydrates	47.34
Total energy	398.34

The energy was calculated as mentioned by Philipose*et al*. (2013) and as follows:

Total energy = % of protein x 5.56 + % of carbohydrates x 4.45 + % of fat x 9.2

Results and discussion

Water tests:

The water temperature ranged during the experiment period from 27.21-20.47°C (Table 3), this degree was among the appropriate degrees for the life and growth of fish (Peteri, 2006).Dissolved oxygen levels ranged from 9.24-7.20 mg/L. The results of the oxygen values were appropriate and permissible for fish to live and their requirements of dissolved oxygen, it can be noted that the inverse relationship between the percentage of dissolved oxygen and temperature, when temperatures rise, this leads to a decrease in the ability of water to retain oxygen molecules (Abdul Hamid, 2009).The pH values ranged from 8.11-7.10, these rates were within the appropriate rates for fish farming (Al-Salman, 1990).Table (3) shows that the salinity rates ranged from 1.8-.5 g/ L, and these rates are permissible in fish farming.

Table (3) Temperature averages, pH values, dissolved oxygen concentration and salinity for the water of floating cages - Euphrates River.

Years	Month	Temperature	dissolved oxygen	pH	Salinity gm/ L

		(°C)	mg/ L		
2022	September	27.21	7.20	7.10	1.80
	October	24.17	8.12	7.78	1.70
	November	20.47	9.24	8.11	1.50

Table (4) Average initial and final weights (± standard error) for fish of different treatments during the months of the experiment.

Traits	**Treatments**		
	T1	**T2**	**T3**
Average starting weight (gm/fish)	24.15 ±1.24 a	25.17 ±1.3a	25.13 ±1.5a
Final weight rate (gm/fish)	90.03 ±3.3 b	89.94 ±4.4b	113.79 ±3.17a

Different letters in the same line indicate that there are significant differences below the probability level (P≤0.05).

Growth parameters

Table (4) shows that there were no significant differences for the different experimental treatments in the average initial weight under the probability level (P≤0.05).The results of the statistical analysis confirmed that there were no significant differences under the probability level (P≤0.05).In the average final weights for the first and second treatments, which recorded a final average weight of (90.03, 89.94 g/fish), respectively, while the third treatment outperformed both the first and second treatments of the experiment, which recorded a final average weight of (113.79 gm / fish).

The results of the current study indicated that the third treatment achieved the highest final average weight over the rest of the experimental treatments, in the third treatment, common carp and grass carp were put together as mixed breeding, in this way, there will be less competition for food between the two species, as each type has a specific food, especially since the cages area contains quantities of natural food and herbs, which was the staple food for grass carp, this made the grass carp obtain adequate amounts of natural food, reduced competition for food with common carp feeding on artificial diets.The current study agreed with the study of Al-Shukrji and Ahmed (2013), who cultured common carp and grass carp together, they obtained higher final average weights than the average weights when cultured individually for both species.

Table (5) Average growth standards for different treatments (± standard error) for fish of different treatments during the months of the study.

Growth parameters	**Treatments**		
	T1	**T2**	**T3**
Weight gain (gm / fish)	65.88 b ±2.90	64.77 b ±2.45	88.66 a ±3.98
Relative Growth Rate %RGR	272.79 b ±9.5	257.33 b ±8.6	352.80 a ±7.7
FCR food conversion rate	3.41 b ±0.22	3.47 b ±0.21	2.53 a ±0.24
Feed Conversion Efficiency %FCE	29.28 b ±1.38	28.78 b ±1.87	39.40 a ±2.36
Protein efficiency ratio	1.04 b ±0.04	1.02 b ±0.09	1.40 a ±0.22

Different letters in the same line indicate that there are significant differences below the probability level (P≤0.05).

Table (5) shows that there were no significant differences (P≤0.05) in the total weight gain rate for both the first and second treatments, which recorded a total weight gain rate of (65.88 and 64.77 gm/ fish), respectively, while the third treatment excelled over the rest of the dysfunctional treatments of the experiment and recorded a total weight gain rate of (88.66 gm / fish).The results of the weight gain rates of the current experiment came as an inevitable result of what came in the results of the final weight rates, the results of the current study agreed with Behairy (2015), who confirmed in his study that higher weight gain rates for co-educational education were higher than the weight gain rates for monogamous education.

As for the characteristic of the relative growth rate, the third treatment was significantly superior (352.80) to both the first and the second treatment.The two obtained a relative growth rate of (272.79 and 257.33), respectively, and which did not show significant differences between them under the probability level (P≤0.05). the relative growth rates were consistent with the final weight rate, because the relative growth rate depends mainly on the final weight rate. The results of the current study agreed with Al-Shukrji (2012), who showed in his study that the best relative growth was achieved when grass carp was cultured with common carp as a polyculture.

The results of the food conversion rate characteristic of the three treatments came during table (5), as they reached 3.41, 3.47 and 2.53 respectively, to confirm the superiority of the third treatment over both the first and second treatment, which did not show significant differences between them.The results of the food conversion rate characteristic were consistent with the results of other growth indicators, which is a natural result of the rates of weight gain and the relative growth of the current experiment.The results of the current

study were consistent with the study of Hamid (2020), as he obtained in his study the best feed conversion rate when rearing common carp with silver and grass carp as a polyculture.The results of the current study differed with Nayef (2009), as he showed in his study that the lowest feed conversion rates were obtained when raising common carp fish with khishni fish as a polyculture.

The rates of food conversion efficiency were identical with the results of the characteristic of the food conversion rate, as it confirmed the superiority of the third treatment (39.40) over both the first treatments (29.28) and the second (28.78), which did not show significant differences between them. The current study agreed with the study of Farhan*et al*. (2015), as the best results of the feed conversion efficiency rate were obtained when polyculture of fish compared to monoculture.

The third treatment was superior in the protein efficiency ratio (1.40) to both the first treatment (1.04) and the second (1.02), which did not record significant differences between them.The high superiority achieved by the third treatment for the protein efficiency ratio is considered a positive result of the positive superiority achieved by this treatment in all growth indicators studied in the current study.Al-Bahadli (2011) confirmed that there is a direct relationship between the rate of weight gain and the percentage of protein efficiency.

References

Abdel-Hamid, M. 2009. Scientific foundations for fish production and care. Egyptian Universities Publishing House, Mansoura, Arab Republic of Egypt.644.

Abu Al-Hani, A.J. 2014. The effect of culture intensity and segmentation of rearing period on the growth and productivity of common carp in floating cages near Kut Dam, Tigris River, PhD thesis, Tikrit University, College of Agriculture. 127 pages.

Alagawany, M., M.R.Farag, S.A.Abdelnourand S.S.Elnesr. 2021. A review on the beneficial effect of thymol on health andproduction of fish. Reviews in *Aquaculture*, 13(1): 632-641.

Al-Bahadli, R.H.T. 2011. Cultivation of different densities of common carp *CyprinusCarpio* in floating cages in the marshes of Maysan Governorate. Master's thesis, University of Baghdad, College of Agriculture: 59 pages.

Al-Salman, M.H.M.A. 1990. Fundamentals of fish farming and production. Dar Al-Hikma for printing and publishing. Mosul: 392 pages.

Al-Shukraji, S.S.H. 2012. Testing water lentils and jet plants as potential feeds for grass carp and common carp. Master Thesis . faculty of Agriculture . Baghdad University. 65 pages.

Al-Shukraji, S.S.H. and H.A. Ahmed 2013. Testing water lentils and jet plants as potential food for grass carp and common carp. Al-Anbar Journal of Veterinary Sciences 6 (1): 44-54.

Behairy, A.M.M. 2015. Studies on mixed culture systems in fish cages. Master Thesis . faculty of Agriculture. Mansoura University. 93 pages.

Davies, S.J. and A. Gouveia.2006. Comparison of yttrium and chromicoxides as inter dietary markers for the estimation of apparentdigestibility coefficients in mirror carp *Cyprinuscarpio* fed ondiets containing soybean - , maize – and Fish derived proteins. Aquac. Nutr., 12: 450-458.

Duncan, B.D. (1955). Multiple rang and multiple F- test Biocmetrics, 11:1-42.

Farhan, T.Y., L.M. Abbas and D.M.Halbous 2015. Mixed culture of multiple densities of common carp and silver carp in floating cages in the Euphrates River. Muthanna Governorate. Al-Muthanna Journal of Agricultural Sciences 3 (2): 1-13.

Hamid, R.M. 2020. Effect of polyculture of carp species reared in floating cages. Master Thesis . *faculty of Agriculture* . Diyala University. 73 pages.

Hua, K, J.M.Cobcroft, A. Cole, K. Condon, D.R. Jerry and A.Mangott. 2019. The future of aquatic protein: implications for proteinsources in aquaculture diets. One Earth 1: 316-329.

Nayef, T.S. 2009. The effect of the presence of al-Khashni fish *Liza abu* in the rearing ponds on the growth and production of common carp. Al Furat *Journal of Agricultural Sciences* 1 (1): 78-84.

. Diyala University. 93 pages.

Olubunmi,A., O. Agagbe, L. Makinde and A. folabi.2009.Production ,Growth and Effect of Varying Stocking density of Clariobranchus. *J. fish. Int*. , 4(4) :73-78.

Peteri A. 2006. Inland water Resources and aquaculture service (FIRI) Cultured aquatic species information programme *cyprinus carpio* Cultured aquatic species Fact sheets FAO Rome .http:www . fao . org.fi.fi.gis.

Philipose, K.K., S.R.K. Sharma, J. Loka, D. Divu, N. Sadhu and S. Dube. 2013. Culture of Asian Seabream (Latascal carifer Bloch) in open sea floating net cages offkarwar,South India.*Indian Journal Fish*,60(1): 67-70.

Salman, N.A., G.J. Al-Mahdawi and A.H. Al-Azzawi. 1997. Acclimatization and rearing of common carp and catfish in the northern part of Saddam River using floating cages. Scientific Journal, Atomic Energy Organization (1) 12: 183-169.

Thiab, D.B. 2019. Effect of garlic and turmeric on some growth traits and blood profile of common carp *Cyprinus carpio* fed diets contaminated with aflatoxin B1. Master Thesis . *faculty of Agriculture*