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Cultivation of different densities of common carp (*Cyprinus carpio* L.1758) in floating cages in the Euphrates River in Nasiriyah city

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Abstract:

current study was conducted to show the effect of culturing common carp *Cyprinus carpio* with different densities in floating cages in the Euphrates River in Nasiriyah city, Dhi Qar governorate, on some growth indicators, for a period of (10/17) 2020 until 10/6/2021). Four different treatments were used in the density of culture (200, 300, 400, 500) respectively, and the average weight ranged between (42-55) g. Floating cages made of PVC were used, the same diet was used to feed fish for the four treatments. The results of the current study were evaluated according to growth criteria (total weight gain, daily weight gain, relative growth rate, specific growth rate, food conversion factor, food conversion efficiency, protein efficiency ratio). The results showed that the first treatment, followed by the second treatment, outperformed the third and fourth treatments. It was concluded from the current study that the lowest densities of common carb achieve the best rates of growth indicators.

Key words: *Cyprinus carpio*, Aquaculture, Floating cage, growth indicator.

I. INTRODUCTION

Increasing local fish production has become a very necessary need, and one of the procedures and measures followed in this is the expansion of the establishment of fish farms and the resort to industrial breeding (FAO, 2004), and the reason for this is the increase in demand for fisheries as a source of proteins, especially amino acids, including methionine and lysine, as they contain trace elements Calcium, phosphorous, iron, vitamin B, and the types of protein provided by fish are better than those provided by other animal meats (Mathiesen, 2012). Aquaculture is the cultivation of aquatic organisms for both coastal and inland areas, which involves overlap in the process of breeding and production, and aquaculture is practiced by some of the poorest farmers in developing countries, as is practiced by companies multiple at the same time (FAO, 2021). Fish farming has been adopted as one of the means to develop production in quantity and quality and one of the pillars of economic development and investment expansion, and the interest in this activity and encouragement of its establishment in Iraq is the availability of water bodies characterized by thermal and salt diversity, as this allows the use of different types of fish in farming (Taher, 2014). Waters of Euphrates River are warm waters suitable for fish growth (Al-Saadi *et al*., 1999). Aquaculture began in Iraq in 1955 with the establishment of the first fish farm in Baghdad with experience of cultivating the usual carp and some local species (Al-Hamid, 1984). After that, it spread widely in the various parts and governorates of Iraq, especially central and southern Iraq. Regions of southern Iraq

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have great potential for aquaculture. , the waters of the marshes and rivers constitute about 70% of the total area of the water bodies for cultivation and therefore it is considered an excellent source of fish wealth provided that full protection is provided (Al-Shama´a, 2005). Carp fish have received the attention of fish breeders for their high fertility and resistance to changes in environmental conditions as well as the ease of cultivation, delicious taste and low cost. Carp fish is one of the most important farmed fish in the world and represents the first rank in the world in terms of production (Balon, 2006). High growth rates of fish receive great attention from fish breeders, as the growth rate is one of the most important metrics and criteria through which level of diets used in fish feeding is evaluated (Youssef and Abdel Samie, 1996) and the different types of food available locally, as well as the type of farmed fish and the method of culture, all of these cause the difference in the culture of farmed fish (Ingram, *et al*., 1997). In a study conducted by Al-Ghazali *et al.* (2015) for fish farms in Dhi Qar Governorate, they found that there are 28 cage fish farming projects located in Nasiriyah city . In another study, it was found that there are 29 projects for raising fish in floating cages located in the Euphrates River in the city of Nasiriyah (Jedran *et al.*, 2015). Therefore, the current study aims to know the effect of culturing different densities of common carp, *Cyprinus carpio* L., on some growth indicators in floating cages in the Euphrates River in Nasiriyah city.

II. MATERIALS AND METHODS

The experiment was carried out in Dhi Qar Governorate / Nasiriyah City / Muhammadiyah Region (3 km from the highway) / Haj Maan farm. 1400 fish of common carp Cyprinuscarpio L, with weights ranging from (42-55) gm, were transferred from the farm of a fish breeder from the hatcheries of Maysan Governorate by a tank car, then it was placed in a cage with an area of 20 x 20 for two weeks in order to adapt it to the conditions of the area and the quality of the water before distributing it to four treatment (200 , 300, 400, 500) fish. PVC pipes were used to make cage frames (the volume of which is 32 m3). The fish were fed on the same concentrated diet (MANAQUA) of Iranian origin, with a protein content of 28%, and the diet was analyzed laboratory to know its components and it was as follows:

Table (1) Results of the laboratory analysis of the fish

Type of examination	Concentration	Units
Total protein	28.43	%
Fats	8.65	%
Ash	7.91	%
Fibers	8.10	%
Moisture	12.15	%

The weights were recorded every 15 days by extracting 10% of the number of fish in each cage each time over a period of 210 days. The complete random design was used in the experiment, the data were analyzed statistically using the SPSS statistical program, and the averages of the transactions were compared using the Duncan (1955) test.

Environmental measurements of water:

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pH, temperature and salinity: All measurements were read by placing the electrode of the Ysl556MPS device of mother origin in the water model after washing and taking the reading directly from the device.

Studied growth indicators:

The weight gain was calculated as stated by . (Philipose *et al.* 2013)

Weight gain (gm) = final weight - initial weight

The daily weight gain was calculated using the Philipose *et al.* 2013 method.

Daily weight gain = (final weight - initial weight) / (first time period - second time period)

Calculating the **specific growth rate** on the Brown (1957) equation as follows:

$$\text{Specific growth rate} = \frac{\text{logarithm of natural final weight - logarithm of natural initial weight)}}{\text{the time period in days between the two weights}} \times 100$$

The relative growth rate was calculated using the equation of Utne(1978),

$$\text{relative growth rate (\%)} = \frac{\text{final weight, starting weight}}{\text{starting weight}} \times 100$$

Utne equation (1978) was adopted in calculating the **Food Conversion Rate (FCR)**

$$\text{food conversion rate} = \frac{\text{feed weight (gm)}}{\text{wet weight gain (live weight) for fish (gm)}}$$

Utne equation (1978) was adopted in calculating **the conversion efficiency Food Conversion Efficiency (FCE)**

$$\text{Food Conversion Efficiency} = \frac{\text{Weight gain of wet fish (gm)}}{\text{feed weight intake (gm)}} \times 100$$

The Protein Efficiency Ratio (PER) was calculated based on the Greking equation (1971),

$$\text{Protein efficiency ratio} = \frac{\text{Discussion Weight gain of wet fish (gm)}}{\text{Protein intake (gm)}}$$

III. RESULTS AND DISCUSSION

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The water temperature ranged during the experiment period between 24.3 - 39.5, the temperatures suitable for the growth of common carp fish were between 23 and 28 °C (Peteri, 2006), while the pH values were recorded between 8.3-8.7, and this range is inclusive of the appropriate limits for the breeding of common carp range between (Horvath *et al.*, 1992). As for salinity, its values ranged throughout the experiment period between 1990-2998. The water temperature showed a wide range of changes, which confirms the temperature of the water environment with the surrounding air temperature, as the lowest values were recorded during the first and second months and the highest during the fourth and fifth semester. The variation in temperature may also be due to the difference in the sampling time and does not reflect the variation in temperature during the day of sampling, as well as affected by the increase in the flow rate that works on the good mixing of the water. The pH values showed very slight variations and they are within the values of the Iraqi determinants of drinking water for the year 2001 and the determinants of the rivers maintenance system and clean water from pollution for the year 1967 and the amendments attached to it, which determined the pH values between (6.5-8.5) and the pH values fall within the basal side, especially the weak base and maintains On this there is a buffering system composed of carbonates and bicarbonates (Lind 1979). This result agrees with (Al-Zubaidi, 1985; Al-Jizani, 2005; Al-Hamdawi, 2009). In general, the pH values increase when the discharge is low (Sabri *et al.* 1989). Also, when the density of phytoplankton is high, as the photosynthesis process activates, the consumption of carbon dioxide increases, and then the pH value increases (Sabri *et al.* 1983, Goldman & Horne). In the cold months, the decrease in discharge results in a rise in the pH values (Sabri *et al*,1989), As for the decrease in pH values during the hot months, it is attributed to the increase in CO2 as a result of the analysis of organic materials due to the action of decomposing organisms whose activity increases when temperatures rise and the respiration process by aquatic animals and plants increases (Goldman and Horn, 1983; Brown, 1980). The salinity values have taken the same pattern as the electrical conductivity values, as their values were extracted from the electrical conductivity values and they express the total concentrations of positive and negative ions in the aquatic environment (Wetzel, 2001). The study results is similar to results of Hassan (1988), Al-Rakabi (1990), Al-Sakini (1990) and Farkha (2005). The reason for this may be attributed to the high levels of river water, the increase in its expenditure rates and the increase in the river water levels. The salinity in the current study is close to the salinity values recorded in the study (Al-Kinani, 2011). On the Euphrates River in the city of Nasiriyah and the results of a study (Farhood, 2012) on the Euphrates River in the city of Nasiriyah. This is due to the fact that if the Euphrates River, during its course towards the south, it was said that it reaches the city of Nasiriyah, it passes through the Al-Mamleh area in the city of Samawah. Therefore, the concentrations of salt in it increase, in addition to the low level of the river. about the surrounding agricultural lands, and this confirms the erosion of the irrigation water that contains salts of the agricultural lands adjacent to the river. The results were similar to the study (Fahad, 2001) on the Euphrates River at the city of Al-Nasiriyah .

Table (1) Environmental measurements of water

Months of experiment	10	11	12	1	2	3	4	5
Physical and chemical variables								

Water temperature T.W.	24.3	22.8	18.5	14.8	17.2	21.6	31.4	39.5
PH	8.70	8.3	8.4	8.35	8.3	8.4	8.4	8.6
Salinity TDS	2500	2983	1990	2145	2145	2728	2965	2998

Studied growth indicators:

1 - Weight gain: The results of the current study showed that there is a significant difference in the total weight gain, daily increase rate, relative growth rates, quality, rate and efficiency of food conversion and the ratio of Protein efficiency among the four study parameters at the probability level (0.05). Table (2) shows that the first treatment recorded the highest total and daily weight gain over the remaining three treatments. The results showed that the total weight gain and daily weight gain were superior to the first treatment with less culture density (200) fish, which had a positive effect through Giving the best growth for farmed fish This result agreed with Al-Bahadli (2011), Farhan *et al.* (2015), as they attributed the reason to the higher weight gain achieved in the lower culture density. Also, the dependence of the growth of fish in cages on the density of culture gives more total weight gain and the least number of them daily. The reason for this is attributed to the fact that fish in high densities cannot obtain enough food provided to them due to overcrowding and competition (Barat and Jha 2005).

2- Specific and relative growth rate: The first and second treatments did not have any significant difference between them in terms of the growth rates. We note from the above that the results of the relative and qualitative growth rate are identical to the results of the total and daily weight gain through the superiority of the fish of the first treatment with low density, which confirms that the densities of culture Effect of improving the growth performance of common carp fish. These results are in agreement with Al-Janabi (2014), which recorded the highest qualitative growth in the lowest culture densities of common carp, and also agreed with the study (Huang *et al.,*2002 ; Narejo *et al.*,2005) indicated that the lower the density of the culture, the larger the fish will be given a larger size through the lack of competition for the feed provided to them, and thus it will reflect positively on the qualitative and relative growth characteristics.

3- Food conversion rate and efficiency: its value for the first treatment was 22.19, for the second treatment it amounted to 24.28, and for the third and fourth treatment it was 52.02 and 62.88, of which the treatments differed significantly at the probability level (0.05). As for the efficiency of food conversion, the first treatment recorded the highest value (4.5), followed by the second treatment (4.11), while the third and fourth treatments reached (1.92 and 1.59), respectively. It can be concluded from the results of the current study that the rate and efficiency of food conversion are positive. Less number of cultures, as previous studies showed that the relationship between the rate and efficiency of feed conversion and the density of culture is inverse (Gomes *et al.*, 2006), and that fish are more effective for food conversion at lower culture densities in cages (Barcellos *et al.*, 2004). These results agreed with the study of Narejo *et al.*(2010) found that the

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feed conversion rate and efficiency of Labeorohita fish in cages was more effective for the lowest cultured densities, as it was mentioned by (Sahin 2001) that higher culture densities in cages for different types of fish adversely affect the conversion rate and efficiency. From the foregoing, we conclude that the rate and efficiency of food conversion are in a state of improvement at the optimum temperatures for growth, as the total live mass of common carp fish and the amount of feed is not equipped with increasing temperature by registering the highest weight The reason is that fish at low temperatures consume less food due to a decrease in the vital activities of fish (2010, Mrcelic and Sliskovic)

Table (2) Total weight gain, daily weight gain rate, relative and qualitative growth rates, feed conversion, feed conversion efficiency and protein efficiency ratio for common carp fish cultured with different densities in cages

Parameters Growth parameters	Treatment one	Treatment Two	Treatment Three	Treatment Four
Total weight gain) (gm/fish)	1352.15a ±26.7	1235.44b 8.93 ±	1155.43c 52.8±	954.26d 9.24±
Average daily weight gain (gm/fish/day)	6.14a 0.12±	5.61b 0.04±	5.25c 0.24±	4.33d 0.04±
Specific growth rate (gm \ % \ day)	0.0065a 0.0001±	0.0064a 0.0001±	0.0063b 0.0001±	0.0059c 0.00008±
Relative growth rate %	2611.38a 214.46±	2511.29a 170.64±	2349.19b 177.5±	1937.09c 93.3±
Food conversion rate	22.19a 0.43±	24.28b 0.17±	52.02c 2.46±	62.88d 0.61±
Food conversion efficiency %	4.5a 0.08±	4.11b 0.02±	1.92c 0.08±	1.59d 0.01±

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