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Study growth *Cyprinus Carpio* L.1758 fish reared in cages using local feed

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Abstract---Current study dealt with cultivation three different densities common carp *Cyprinus* carpio in floating cages in Euphrates River / south of Nasiriyah city in Al-Fadhliah district from 9/5/2021 to 2/5/2022 to obtain the best culture density per cubic meter. Three densities (- 75 fish | 3 m) were used, 1000 fish for the first treatment, 2000 fish for second treatment, and 3000 fish for the third treatment, with an average weight ranging between 104 + _2 for each treatment. One local diet was used for three treatments. The temperature during the experiment period ranged between -15 30 C, pH values ranged from (7.5-805) and dissolved oxygen concentrations (Do) ranged from (705 - 1004) mg / liter, while salinity was (005 - 200) g / liter and light transmittance ranged from (27 - 31) cm. The results of the experiment were evaluated according to the following criteria: total weight gain, specific growth rate. , relative growth rate, feed conversion rate, food conversion efficiency, protein efficiency ratio and the current study showed the superiority of the fish of the first treatment with the least significant density over the rest of the treatments followed by the second treatment, which in turn outperformed the third treatment, and the chemical analysis that was conducted on the fish body contents of Protein after the experiment for all treatments and there were no significant differences for fish components among the three treatments. The best profit was recorded in the third treatment, and best profit coefficient was recorded in first and second treatment. We conclude from this study that best weight of fish is given in ponds of less density because they take their sufficiency from the necessary food.

Keywords---study growth, cyprinus carpio, fish reared, local feed.

Introduction

Carp family is characterized by ease of cultivation and acceptance by consumer. Therefore, the common carp, *Cyprinus carpio*, has received a great deal of attention. Therefore, it was raised in fish farms because it has high production rates, rapid growth and resistance to changes in environmental conditions (Abdul Hamid, 2019). Fish meat is characterized by a high nutritional value, as it contains a high percentage of protein, estimated between 90% _60 of the dry weight, in addition to the fact that fish contains all the essential amino acids necessary for humans. Fish meat contains fats with essential fatty acids (linolenic, linoleic, oleic and palmitic) that are useful for diseases The heart, because it contains the omega-3 group, the addition of important vitamins and minerals necessary (Al-Bahadli, 2011), and the physical and chemical properties have an effect on fish culture in cages, as well as management, good nutrition and lack of dissolved oxygen Increasing or decreasing salinity, high water temperature, and culturing fish of the family of cyprinids, especially common carp, received widespread attention due to their rapid growth, high production rates, clear resistance to sharp changes in environmental conditions, ease of cultivation and availability of their requirements.

Materials and Working Methods

Description of the study area

Experiment was carried out in Dhi Qar Governorate / Suq Al-Shuyoukh district / in one of the farms of Al-Fadhliyah district on the banks of Euphrates River. length of Euphrates River is 2780 km from its branch point, the height of its source is 4500 m and the amount of its water flow is 818 square meters per second. The date palm has an estimated area of 9325 km (Al-Ghazi, 2004)

Table 1
Proportions of ingredients of the diet

Fodder material	percentage
Protein	20
yellow corn	15
soybean meal	20
wheat flour	27
Bran	15
Wheat	3

Material	percentage
Protein	30.34
Fat	6.38
Humidity	4.26
Ash	147
carbohydrates	51.88
Energy Kcal/100gm	452.802

Laboratory work

In the laboratory, the ration was chemically analyzed and the proportions of its components were known because of their impact on fish growth and productivity increase. A sample was taken from the first and last meal of fish and frozen to estimate the nutritional value in it. The measurement was carried out in the laboratory of the College of Marine Sciences / University of Basra / Department of Fish, and water samples were collected for all chemical and physical examinations.

Studied growth traits
Temperature

Table (4) shows the temperatures over the months of the experiment. The lowest value was + (1404) in September compared to February, and these values recorded in the current study are appropriate for the growth of common carp fish, and that the appropriate temperatures for the growth of common carp fish ranged between (23-28 m) for water temperature is closely related with most of the vital activities of fish such as nutrition and growth. When temperatures drop at certain levels, the ability of fish to perform various vital activities stops or decreases, and this negatively affects growth and temperatures rise within certain limits and the ability of fish increases To carry out vital activities and increase growth rates, the temperature values ranged between (13-30°C) in the Euphrates River, and the highest temperature recorded was 31°C in Basra Governorate, and the temperature in the marshes of Maysan Governorate between (9-27°C) and the results of a study conducted In Mar Al-Suwayb - southern Iraq, with temperatures between (1007-340) and the differences in temperature are attributed to many factors, including the difference in environments, the study times, different locations and weather factors. These results agreed with what was stated by Abdul Hadi (2021), Al-Kinani (2011) and Al-Jandil (2001). This similarity is due to the fact that the area in which the study was conducted is in the city of Nasiriyah, as came the study he conducted (Al-Kinani, 2015).

pH

pH values were recorded between (7-8) during the months of the experiment and they are within the appropriate limits for breeding.In a study by Al-Bahadli, (2011) values were recorded between (605-9) and the results were similar to many researchers, including Abu Al-Hani (2014), Sabri (2006).

Dissolved Oxygen

Values of dissolved oxygen (Do) ranged between (803 - 907) mg / liter, the highest value was recorded in December and the lowest value in December. The relationship of dissolved oxygen with temperature is an inverse relationship, as the capacity of water is low to retain dissolved oxygen molecules when the temperature rises (Abdul Hamid, 2019) •

Salinity

Salinity values ranged between (200-500) g / liter and these ratios are suitable for fish growth, and the salinity expressed the concentrations of negative and positive ions present in the water sample. The results of the statistical analysis showed that there were no significant differences in salinity values between the study stations during one month, and the presence of significant differences during the months, and that the increase in salinity rates during the summer months is due to a rise in temperature that is directly proportional to the concentrations of salts (Hamoudat, 2010, Al-Ta'i 2009, Abowie, 2010). This study agreed with (Al-Jandil, 2001) and (Al-Kinani, 2015) and the rise is attributed to the high water level and the low rates of evaporation during the winter season (Alcom and his group, 2002, Khalaf, 2013, Saleem, 2013).

Light transmittance

Results of current study recorded light transmittance values ranging between (36-32) cm. The light transmittance in the aquatic environment changes according to the purity of the atmosphere, sunlight and the density of clouds and affects the physical properties of water. Light transmittance is one of the excellent properties of water as it can be measured quickly and using easy and simple transmittance devices.

Month	Do. Ml / l	Water temperature	Turbidity	pH	light transmittance
September	7.6	14.5	15	8.0	27
October	7.4	12.50	9	8.4	23
November	10.9	10.5	19	8.3	25
December	9.8	9.7	21	7.9	31
January	8.21	13	32	8.5	30
February	10.4	19.0	15	8.1	32

Total weight gain

After conducting the statistical analysis, it was found from the results of the case study that there were significant differences ($p < 0005$) in the total weight gain between the different treatments, where the first treatment showed superiority in the total weight gain (470) g / fish over the second treatment, which amounted to 400,000 (gm / fish). The third treatment amounted to (300) g / fish - the results of the statistical analysis showed in the month of October, Table (6) shows that there are significant differences between the first treatment (650) g / fish and the second (600) g / fish, and they were significantly superior to the fish of the third treatment (550)) g / fish, the results of the month of November showed that the first treatment (850) g / fish was superior to the second treatment (800) g / fish and the third (775) g / fish, where the results of the statistical analysis showed significant differences between the three treatments, the results of the month December There were no significant differences between the first two treatments (1100) g/fish and the second (1050) g/fish, while the third treatment (950) g/fish showed significant differences between them. The results of January showed the superiority of the first treatment (1350) g/fish over the second treatments (1100)

g/fish and the third (1075) g/fish, and there were no significant differences between the second and third treatments. The results of the statistical analysis in February were somewhat close between the three treatments, where the first treatment reached (1500) gm/fish, the second (1400) gm/fish, and the third (1300) gm/fish.

From the results of the growth of common carp fish cultured in cages, which included cultured with three different densities per cubic meter, the total weight gain of fish cultured with the lowest density outperformed 30 fish / m3, which has a positive effect on the weight gain, as it gave the best growth per unit volume, between (2016) Abbas et al. The best weight gain of total carp fish cultured in cages was in treatments with a low density of (35) fish/m3. These results are in agreement with the results of Olmeuni et al (2009) when Clariobranchus fish were cultured with four densities, where (20-40-60-80) fish/m3 were cultured per cubic meter for (98) days in floating cages, and the results of the statistical analysis showed the superiority of the treatment. First on the rest of the transactions. This current study agreed with the results obtained by Abd al-Hadi (21), where the results were similar to the current study. (2002) Ahmed et al indicated the cultivation of common carp fish with different densities in Kapatia Lake in Bangladesh, where it achieved the best weight gain estimated at (32505) g In the density of culture (30) fish / m "and this is a similar approach to the density of culture in this experiment. The results of this study were close to the results of Al-Bahadli (2011), where the best weight gain was (241) gm in density of (40) fish / m3 for cultured carp. In floating cages, as it was similar to the results of this experiment, the results of the current study differed with the findings of Al-Janabi and Merdes (2012) they recorded the best total weight gain in the density of culture (70) fish / m3 for carp fish cultured in cages, between Al-Bahadli (2011) the best growth of fish Carp cultured in cages was at the lowest density, which is similar to the results of this experiment between Taher (2014) that the best weight gain in the density of culture was (75) fish/m3, and this result was not similar to the results of the current study.

Table 5
The effect of different breeding densities fish / m 3) As for the rate of weight gain (mean + _ standard error)

Transaction/month	September	October	November	December	January	February
T1 (700)	470.00 A ± 0.577	650.00 A ± 0.577	850.00 A ± 0.577	1100.00 A ± 0.577	350.00 A ± 0.577	1600.00 A ± 0.577
T2 (1000)	400.00 B ± 0.577	600.00 B ± 0.577	800.00 B ± 0.577	B ± 0.577 1050.00	1100.00 B± 0.577	1400.00 B ± 0.577
T3 (1500)	300.00 C ± 0.577	550.00 C ± 0.577	775.00 C ± 0.577	950.00 C ± 0.577	1075.00 C 0.503±	1300.00 C ± 0.577
Morale	*	*	*	*	*	*

Qualitative growth & relative growth

Table (6) shows the qualitative growth rate as final results. When following it up, it was noticed that there were no significant differences {P < 0.005} between the first treatment (0096% g/day) and the second treatment (0089% g/day). day) and

were significantly superior to the fish of the third treatment (0.72% g/day). These results are similar to the results of (Abdul Hadi Ahmed Riyad, 2021).

Table 6
Shows the specific growth rate of different densities in cages for common carp over the months of the experiment

Transaction	Months					
	September	October	November	December	January	February
T1	0.96 A	1.20 A	1.40 A	1.07 A	0.73 A	A 0.80
T2	0.89 A	1.04 B	1.15 AB	1.12 A	0.71 A	A 0.85
T3	0.72 A	1.02 B	1.12 B	1.06 A	0.85 A	A 0.84
				N.S	N.S	N.S
*significant P<0.05 N.S insignificant						

Table 7
The relative growth rate of the carp fish cultured with different densities in the expression over the months of the experiment

Transaction	Months					
	September	October	November	December	January	February
T1	A 35.66	A 45.72	A 48.71	A 37.03	A 24.8	A 31.02
T2	A 29.65	B 39.08	AB 41.77	A 36.51	A 25.4	A 31.07
T3	B 21.26	38.18	B 38.79	38.25	A 30.6	A 31.06
Significant	*	*	*	N.S	N.S	N.S

Feed conversion rate and efficiency

The feed conversion rate is expressed as the ratio between the weight of the food provided to the fish and the wet weight gain of the fish, and it is a good measure of the efficiency of the diet. As for the efficiency of food conversion, it is the reciprocal of the food conversion factor, but as a percentage defined as the extent of utilization of the food consumed. The results of the statistical analysis of the character of the food conversion factor (Table 8) in September showed no significant differences between the fish of the first treatment (5.29) g fodder/gm and the second treatment (6.54) gm/gm and were significantly superior to the third treatment (9.10) gm feed/gm. And the results of the statistical analysis for the month of October showed the moral superiority of the fish of the first treatment (3.89) gm feed / gm over the rest of the treatments and there were no significant differences between the second treatment (4.73) gm feed / gm and the third treatment (4.86) gm feed / gm. This superiority continued for the first treatment in the month of November to record (4.06) gm of feed / gm, and the second and third treatment did not register any differences.

Significant among them (4.75,4.58) gm of feed / g. It was noticed in December that there were no significant differences (> 0.05p) between the fish of the three

treatments, and the values were (4.93, 3.11, 3.05) gm feed / gm. The results of the month of January were similar to the month of November, and no significant differences were recorded between the treatments, and the values were recorded for the first treatment (4.74, 4.03, 4.71 gm of feed / gm). The month of February did not differ from the previous months, and no significant differences were recorded for the three treatments (3.07, 4.95, 3.03), and these results were similar to the results of (Abdul Hadi, Ahmed Riyadh, 2021). Table (8) shows the feed conversion rate of common carp fish cultured with different densities in cages over the duration of the experiment.

Transaction	Months					
	September	October	November	December	January	February
T1	5.29 B	B 3.89	B 4.03	A3.05	4.74 A	3.07 A
T2	6.54 B	A 4.73	A 4.58	3.011 A	4.71 A	4.95 A
T3	9.09 A	A 4.86	A 4.75	A 4.93	4.03 A	3.03 A
	*	*	*	N.S	N.S	*
*significant (P<0.05)						

The results of feed conversion efficiency showed similarity with the feed conversion efficiency rate, and the first treatment, the least intense, was superior to the second and third treatments. Table (9) shows that there were no significant differences in September between the fish of the first treatment (15.89)% and the fish of the second treatment (13.28%) and significantly outperformed the two. The fish of the third treatment (9.97) %. In October, the fish of the first treatment exceeded (20.40)% over the fish of the second and third treatment, which did not show significant differences between them. 27.84%) and the third treatment (25.65%) fish, which did not record any significant differences between them, in The month of December and January) the results were identical to the results of the feed conversion rate and there were no significant differences between the fish of the three treatments and the values were recorded, the month of December (20.68, 21.50, 20.84%) and the month of January (25.71, 26.38, 32.96%) and the month of February) 30.32, 0% (31.94, 32.70)

Table 9
The feed conversion efficiency of carp fish cultured with different densities in cages over the months of the experiment

Transaction	Months					
	September	October	November	December	January	February
T1	A 15.89	A 20.40	A 30.48	A 20.86	A 25.71	A 30.32
T2	A 13.28	B 17.44	B 27.84	A 20.84	A 26.38	A 32.70
T3	B 9.97	B 17.04	B 25.65	A 21.50	A 32.96	A 31.94
	*	*	*	N.S	N.S	*

Retention rate

Table (10) shows the survival rate of the different transactions, as the first treatment recorded the highest survival rate compared to the rest of the transactions, which amounted to (95%) followed by the second treatment with a

survival rate of (90%) and then the third treatment (88%). The results of the statistical analysis showed that the first treatment was significantly ($P < 0.05$) superior to the second and third treatment. Survival rates show that high densities have increased fatalities, which led to a decrease in the survival rate. The reason is due to overcrowding in the unit area and strong competition for food and thus the occurrence of fatalities (Stckney 2000). Nurun Nabi (1997) recorded a survival rate of (99.5%) higher than the current study of cultured common carp fish. And the second, with densities of 25 and 40 thicknesses / m3, which was confirmed by Alev . (2003).

Table 10
Survival rates for the three treatments

Transactions	Density of 3 cultures (fish/m)	Fish in cages Nu.	Deaths Nu.	Survival rate
T1	30	700	45	97A
T2	50	1000	130	92B
T3	75	1500	239	90C

Protein Efficiency Ratio

Table (11) The results showed that there were significant differences between the treatment fish for protein efficiency, and the first treatment (1.50) outperformed and no differences were observed between the second and third treatment with each other, but when reviewing the results of the protein efficiency ratio for the three treatments fish over the months of the experiment, Table (13) And Figure (11) there were no significant differences between the first treatment (0.535) and the second treatment (0.431), and they outperformed the third treatment.

Table 11
Efficiency ratio of protein for carp fish cultured with different densities in cages over the months of the experiment

Transaction	Months					
	September	October	November	December	January	February
T1	A 0.535	A 0.716	A 1.200	A 0.900	A 1.292	A 1.068
T2	A 0.431	B 0.597	B 1.110	A 1.020	A 1.348	A 1.095
T3	B 0.299	B 0.581	B 1.065	A 0.993	A 1.317	A 1.318
	*	*	*	N.S	N.S	*

Al-Bahadli (2011) found the best protein efficiency ratio for common carp cultured in cages in the case of using a submerged diet, which amounted to (0.94) in the first treatment with a density of 20 fish / m3 compared to the average protein efficiency ratio, which reached (1.058) when using feed. Chemical analysis of fish body: results of the chemical analysis of the bodies of fish raised in cages for three culture densities (table 12) showed no significant differences in the fish contents, but the highest moisture content was recorded in the first treatment (72.31) and the lowest in the third treatment (72.00)%, and the highest

percentage of crude protein was recorded in the treatment The second treatment was (15.90)%, and the lowest percentage in the third treatment was (15.00)%. The highest percentage of crude fat in the treatment was (6.60)%, and the lowest in the second treatment was (6.12)%. As for carbohydrates, the highest percentage was recorded in the third treatment (2.68%) and the lowest percentage was in the first treatment (2.37%), as for ash, the highest percentage was recorded in the third treatment (4.46) and less than it in the second treatment (4.16)%. We note through chemical analysis of fish muscles in the experiment that there are no significant differences and this confirms the absence of any effect of culture density on the internal content of the body components of protein, fat, moisture, carbohydrates and ash. These results are similar with Abd al-Hadi (2021) in his experiment, as well as with al-Bahadli (2011) when culturing four densities (20, 80, 60, 40) fish / m3 and no significant differences were recorded between the four treatments.

Table 12
Chemical analysis of muscles of common carp fish cultured in cages for three culture densities for a period of 200 days based on wet weight (mean + - standard deviation)

The Ingredients	Chemical composition of fish before experiment	Chemical composition of fish after experiment (%)			significant
		T1	T2	T3	N.S
Humidity	71.47	_+72.31 A 0.46	72.30 0.20_+A	0.56 72.00_+A	N.S
Protein	14.29	0.03_+15.16 A	0.30 15.90_+A	A 0.75 15.00_+	N.S
raw fat	7.72	6.50_+0.16 A	0.02 6.12_+A	_+6.33 A 0.04	N.S
carbohydrates	1.03	2.37_+ 0.07 A	2.38_+0.06 A	_+4.46 A 0.02	N.S
Ash	5.49	0.27 4.16_+A	4.16_+0.04 A	+_4.46 A 0.02	N.S

Calculation of economic feasibility: Table (13) shows the calculation of the economic feasibility of the experiment for three transactions on the basis of the final weight of each transaction, and the expenses were calculated for each transaction for the purpose of determining the best treatment based on the criteria of net profit and profit coefficient. Materials and others, bearing in mind that the cost of the cages was estimated depending on the knowledge of the different parts of the cage, and the percentage of depreciation was estimated at (21%) on the basis of five years for the cage, and the price of one cage was estimated at one million Iraqi dinars. Feed, fish and other costs such as labor and wages.

Table 13
Economic feasibility of transactions with profit coefficient and net profit for each transaction

Material	T1 30 fish /m^3	T2 50 fish /m^3	T3 75 fish /m^3
20% of the fixed capital	200000	200000	200000
The price of the containers in dinars with the price of transportation	750000	750000	750000
Feed price / dinars	2139250	3839500	5493250
Feed quantity / kg	2789000	5206000	7411000
Live mass kg workers' wages revenue (sale price) / kg	915418	1395336	1997765
Expenses	350000	350000	350000
profit factor	5090000	7675000	9985000
Net profit	3359250	5829500	8233250
Feed price / dinars	122.75	118.55	122.27
Feed quantity / kg	740760	1243500	1851750

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