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Study of Cyprinus carpio fish growth using local feed in mud basins

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***Abstract*---**The current study used cultivating the Cyprinus carpiofish in three lakes that were supplied with water from Al-bada'a River in Al-Rifaay County –Al-Nadhim Village and the fish were cultivated with unified density in all of the three lakes for a duration started from 02/Sep/2021 to 22/ Feb/2022 and three unified treatments were used in cultivation density 1000/m3 divided equally on three lakes with average weight of ±20 gm. A unified local feed was used to feed the fish in the lakes. The temperature ranged between 14-28 cº potential hydrogen of 7-8.5. Dissolved oxygen was between6.7-9.0mgm/liter, salinity 0.2-0.3gm/L. The study included the rate of total weight increase, rate relative growth, and qualitative growth rate, food conversion factor and its efficiency, protein efficiency rate. Statistical analysis results have shown significant differences $p<0.05$ in total weight increase and among the different treatments the first one showed a clear progress $p<0.05$ in monthly weight increase 400.0gm per fish from the rest of the treatments during February. A significant progress for the fish of the second treatment with a rate of 1.600% within the relative growth rate in November.in qualitative growth rate the first treatment fish were significantly superior in that with a rate of 128.333gm/day in October.in food conversion factor and its efficiency the second treatment was superior by 1071 gm/ significant increase $p<0.05$ of feed in food conversion for the month of December.in food conversion rate the third treatment made a significant record of 61.21gm of feed/gm in October whereas the third treatment was superior in protein efficiency rate as shown in the statistical analysis results with a rate of 62.210%. The results have shown that the protein rate in fish muscles after the experiment has reached its highest peak of 5.76% and the lowest rate of fish muscles

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before the experiment was at a rate of 3.61% which means the rate has decreased at the beginning of the experiment where a noticeable increase was found in the end of experiment in the precipitated protein in fish bodies. The experiment results by using dry weight method analysis that there was a difference in fats rates in the chemical analysis for the fish muscles before the experiment was 0.0048% when after the experiment the rate reached 39% in the chemical analysis for the fish muscles and that is because of the increase in fish size during the time of the experiment after the fish depended partially on the natural nutrients in the basins as a part of the feeding process. The current study has shown an increase in ashes rate that reached 5.49% when measured by using dry weight method, after the experiment it was decreased to 4.25%.Study results have shown an increase in carbohydrates rate from 0.00069 to 0.485. Survivability of fish wasn't effected in the first month of the experiment, October, November, and December, except in the last months of experiment, January and February.

***Keywords*---**Cyprinus carpio, local feed, mud basins.

Introduction

Fishery resources are a considered a national wealth and an important national income resource in many countries (shams and others2021), there are over a billion people who are dependent on fish as an income and nutritional source (FAO, 2016). Fish are characterized by their high nutritional value for their high content of animal protein which is necessary for growth enhancement and improving the health condition for the plethora of essential and non-essential amino acids that contain high biological value (et al, 2021), lithium and essential fatty acids, mineral elements and vitamins (Byrd et. Al, 2020). Although Iraq has a vast water space estimated by 1.1 million hectares Euphrates and Tigris are part of it and they are the sources of sweat water (Hussein *et al.*, 2021) and the availability of many fishery resources with high capability to grow, reproduce and cultivate like Hypophthalmichthys molitrix, Ctenopharyngodonidella and Cyprinus carpio that Iraq started importing them from Indonesia in 1956, and the availability of many of fish hatcheries, except Iraq still depends on importing to cover the needs for fishery resources whereas it was estimated that the need for fish in 2008 was approximately 58 thousand tons and for 2020 approximately 86 thousand tons of fish (Gabarse, 2017). Natural growth of fish is effected by many environmental and health changes like water temprature (raventos et.,al,2021) and water quality, salinity increase (Nassar et.,al,2021) light intensity (Ruchin et.,al,2021)dissolved oxygen in water (baxa et.,al,2021), potential hydrogen (liu et.,al,2021) in addition to the density of fish cultivation which effects the natural growth rate and health condition and could directly damage the natural growth if it increases over the natural rates (Stejskal et.,al,2021). Whereas the limitation of the cultivation density is important considering the surrounding circumstances for the purpose of achieving the highest beinfti of the cultivation (Kunda et.,al,2021).

Materials and Operational Methods

The study was cducted in Nadhim's village No(4) which is 6km away from Al-Rifaay County north of DhiQar city where I brought 1000 finger size of Cyprinus carpio fish from Almahaweel hatcheries that belong to Babylon city with weights ranged between ±20 gm and the fish were equally divided on three lakes. The experiment was conducted on 02/Sep/2021 and continued until 22/Feb/2022 in Al-Rifaay County. Fish weights were measured monthly by using German made electronic balance and they were fed with a local feed.

Table 1
Feed components before chemical analysis

Feed material	Percentage %
Soy	30
Protein	10
Flour	40
Corn	10
Sift	8
Salt	1
Lime	1

Table 2
Cemical analysis for experiment feed using dry weight method

Feed material	Percentage %
Protein	30,81
Fat	8,38
Humidity	5,26
Ash	7,14
Carbohydrates	48,41
Energy Kcal/100gm	463,824

Field works

Water samples gathering

Water samples were gathered to conduct a physical and chemical tests.

Fish samples gathering

Fish samples were gathered for the purpose of weighing them on a monthly basis during the study period, also the first and last batch of fish were taken and frozen to estimate the nutritional value.

Water tests

Water temperature was measured by using a mercury thermometer and the process was done by submerging the thermometer in the water in the morning to guarantee the accuracy of the test during the times of weighing fish.

Dissolved Oxygen measurement

Dissolved oxygen was measured by using oxygen meter to determine the dissolved oxygen in the natural water and the resulting measurement was expressed by mgm/liter.

Potential hydrogen

Potential hydrogen was used to measure PH level using PH field meter.

Salinity

Salinity was measured by using conductivity meter type (TOA).

Results and Discussion

Table (3) shows the range of temperature throughout the duration of experiment when the lowest temperature was in January 14c° and the highest was in September 28 c° and the recorded temperature in the current study was fit for cultivation of Cyprinus carpio fish (peteri, 2006). PH recorded levels were 7-8.5 which is considered within the good limits for cultivation. Oxygen ranged between 6.7-9.3 mgm/L the highest was in February and the lowest in June, The relationship between oxygen and temperature was inverse when water ability decreased to sustain dissolved oxygen when temperature rises (Abdul Hameed, 2009).

Table 3
Shown salinity which ranged between 0.2-0.3 gm/L which is considered good for fish growth

Month	Water temperature c°	Dissolved oxygen mgm/L	PH	Salinity Gm/L
September	28	6,7	7	0,3
October	23,2	7,3	7,8	0,3
November	19	8,4	8	0,2
December	14	9,3	7,5	0,3
January	14,4	9,0	8,1	0,2
February	15	9	8,5	0,3

Studied Growth Features

Monthly and total weight increase, results of current study showed that after conducting the statistical analysis the existence of significant differences as in

$p<0.05$ in total weight increase among the treatments, whereas the first treatment has shown a clear superiority in total weight increase 400.0gm/fish from the rest of the treatments and significant differences between the second and third treatment 386.0gm/fish for the second and 390.0gm/fish for the third treatment. The results of the statistical analysis have shown in October significant differences between the first treatment 57.0gm/fish and the second treatment 66.0gm/fish and they were superior from the third treatment 46.0gm/fish. The results of November have shown a superiority of the second treatment with 155.0gm/fish as the highest weight increase from the rest of the treatments when the first treatment made a record of 103.0gm/fish and the third 100.0gm/fish.

The results of December have shown a significant superiority of the second treatment with an increase of $p<0.01$that reached 215.0 gm/fish from the first and third treatment consecutively as in 203.0gm/fish and 185.0gm/fish. The results of January have shown a superiority of the third treatment as in 390.0gm/fish, and the first and second treatment made a record of approximate weights as in 377.0gm/fish and 375.0gm/fish. The results of February have shown a superiority of the first treatment as in 400.0gm/fish over the second and third treatments where they reached weights of 386.0gm/fish and 340.0gm/fish consecutively. The results of the total weight increase rate reflected upon the results of the monthly weight increase in experiment duration in table (4), the results of the statistical analysis recorded a disparity in weights during the months of experiment where it's recorded the highest weight increases during the final months of the experiment in February then January and December.

Relative growth rates were similar to the qualitative growth rates whereas the results of the statistical analysis have shown for February and October similarity and no significant differences were noticed between the two treatments along the months of experiment as in October they were216, 2.263, 2.626%, and in February they were 0.7, 0.740, 0.810, and 0.16%. In November there was a record of superiority for the second treatment fish with percentage of 1.600% significantly outgrowing the first treatment 1.366 and the third 1.133%. Statistical analysis results for December that there were no significant differences between the fish of the first and second treatments 0.930% and 0.906% where the third had made a significant difference of 0.700%.

In January the fish of the second and third treatments didn't have a significant differences as they came with 0.670% and 0.750% consecutively, whereas the fish of the first treatment recorded a s significant difference of 0.766%. Qualitative growth rate was shown in the statistical analysis results for October as the first treatment fish were significantly superior in it by 128.333% gm/day over the second and third treatments as they came 75.3335 and 102.666% gm/day. In November the superiority of the first treatment was seen in 54.00gm/day significantly over the second and the third treatments 24.00% and 36.00% gm/day. In December the first treatment was superior over the second and third treatments again as it came 33.09% and the rest were 27.966% and 29.166% gm/day. No significant differences were noticed among the three treatments in January as they all were 23.800, 24.966, 26.200% gm/day. The first treat was significantly superior in February as it came 22.2005 gm/day and, no significant differences were noticed in the second and third treatments as they were 23.666% and 24.300% gm/day.

The Factor and Efficiency of Food Conversion

Results of the statistical analysis for the feature of food conversion have shown an existence of significant differences among the treatments in October, the second treatment was on top as it came in 1022 gm of feed/gm, the first treatment was 1019 gm of feed/gm and the third treatment1015 gm of feed/gm. In November the second treatment was on top as well when it came in 1071 gm of feed/gm over the rest of the treatments, the first was 1067 gm of feed/gm and the third was 1061 gm of feed/gm. In December the second treatment was on top as well when it came in 1071 gm of feed/gm over the rest of the treatments, the first was 1067 gm of feed/gm and the third was 1061 gm of feed/gm. It's been noticed that there no significant differences among the treatments as their values were1.125, 1.125, 1.130 gm of feed/gm. The results of February are similar to the ones from December and no significant differences were recorded among the treatments whereas their values were.131, 1.130, 1.142 gm of feed/gm.

In October the fish from the third treatment were significantly superior as they recorded the highest food conversion factor value of 62.21 over the rest of the treatments while the first treatment was 52.63 and the second 45.45. In November the fish from the third treatment were also significantly superior where it's reached 30.00 higher than the first 29.19 and the second 19.35. In December the fish from the third treatment were also significantly superior where it's reached 16.21 higher than the first 14.77 and the second 13.95. It's been noticed in January that there were no significant differences $p<0.05$ among the fish of the treatments and the recorded values were 7.95, 8.00, and 7.69. The values in February were similar to January and they were recorded as follows, 7.50, 7.57, 6.81.

Protein efficiency rate

For October the statistical analysis results have shown the significant superiority of the third treatment fish 66.210 over the first 52.630 and the second 45.450. In November the second treatment made a record of significant differences 19.350 over the rest of the treatments, the first and the third didn't have any significant differences even though they were mathematically superior 30.00 and 29.120. In December there were significant differences among the experiment fish where the third treatment fish were superior significantly 16.210 over the first 14.770 and the second 13.950. The results of January and February were similar and no significant differences were noticed among the fish of the three treatments whereas in January they were recorded as follows 7.950, 8.000, 7.960 and in February 7.500, 7.570, 6.810.

Table 4
The effect of cultivation basin on the feature of total weight increase rate within the months of the experiment gm

Arithmetic average ± standard error

Basin /Month	October	November	December	January	February
First (T1)	46.0 ± 0.577c	100.00.577 ±a	174.0 0.577 ± b	23.00.497 ± b	380.0 ± a0.477
Second (T2)	89.0 ± 0.577a	60.0 ± c 0.577	160.00.577 ±c	11.00.502±c	366.0 ± 0.597 b
Third (T3)	54.0 ± 0.577b	85.0± 0.60b	202.0 ±0.577a	50.0 ± a0.577	320.0 ± 0.587c
Significance level	*	*	**	**	*

Averages that carry more than one letter within a single column indicate a significant difference.
*: Significance level p<0.05, **: p<0.01, Non-significant.

Table 5
The effect of the cultivation basin (lake) on the feature of total weight gain gm within the cultivation months

Arithmetic average ± standard error

Basin /Month	October	November	December	January	February
First (T1)	57.0 ± 0.727b	103.0 ± 0.577b	203.0± b 0.497	377.0 ± 0.457b	400.0 ± 0.577a
Second (T2)	66.0 ± 0.437a	155.0 ± 0.667a	215.0 ± 0.447a	375.0 ± 0.767c	386.0 ± 0.577b
Third (T3)	46.0 ± 0.667c	100.0 ± 0.577c	185.0 ± 0.557c	390.0 ± 0.767a	340.0 ± 0.557c
Significance level	*	*	**	*	*

*: Significance level p<0.05, **: p<0.01, Non-significant.
Averages that carry more than one letter within a single column indicate a significant difference.

Table 6
Effect of the cultivation basin on the feature of qualitative growth rate within the cultivation months

Arithmetic average ± standard error

Basin /Month	October	November	December	January	February
First (T1)	128.3331.6 6 ± a	54.000.57 7 ±a	33.090.659 ±a	23.8000.61 1 ±a	22.2000.15 2 ±b
Second (T2)	102.66610.	36.00 ± b3.511	29.1661.87 4 ±ab	26.2000.20 0 ±a	23.6660.33 3 ±a

	08 b ±				
Third (T3)	75.333 1.33 ±c	24.88 ± 0.061c	27.2660.37 1 ±b	24.9661.18 3 ±a	24.3000.35 1 ±a
Significance level	**	*	*	N.S.	*

*: Significance level p<0.05, **: p<0.01, Non-significant.
Averages that carry more than one letter within a single column indicate a significant difference.

Table 7
Effect of the cultivation basin on the feature of relative growth rate within the cultivation months

Arithmetic average ± standard error

Basin /Month	October	November	December	January	February
First (T1)	2.626a0.03 8 ±	1.366± 0.033b	0.906±0.06 8a	0.670 ± 0.001b	a 0.8100.035 ±
Second (T2)	a2.2160.22 1 ±	1.6000.057 ±a	0.930 ± 0.020a	0.750±0.02 6a	a 0.7400.025 ±
Third (T3)	a2.26±00.25 3	1.133±0.03 3c	0.7000.036 ±b	0.7660.020 ± a	a 0.7160.029 ±
Significance level	N.S.	*	*	*	N.S.

*: Significance level p<0.05, **: p<0.01, Non-significant.
Averages that carry more than one letter within a single column indicate a significant difference.

Table 8
Effect of the cultivation basin on the feature of food conversion efficiency within the cultivation months

Arithmetic average ± standard error

Basin /Month	October	November	December	January	February
First (T1)	1.0190.005 ±b	1.034±0.00 4b	1.067 ± 0.00b	1.125±0.00 5a	1.131 ± 0.005a
Second (T2)	1.0220.005 ±a	1.050 ± 004.0	1.071 ±0.005a	1.125 ±0.002a	1.130±0.00 5a
Third (T3)	1.0150.005 ±c	1.033 ± 0.004b	1.0610.006 ±c	1.130 ±0.005a	1.142±0.00 6a
Significance level	*	*	*	N.S.	N.S.

*: Significance level p<0.05, **: p<0.01, Non-significant.
Averages that carry more than one letter within a single column indicate a significant difference.

Table 9
Effect of the cultivation basin on the feature of food conversion rate within the cultivation months

Arithmetic average ± standard error

Basin /Month	October	November	December	January	February
First (T1)	52.630±0.577b	29.120±a 0.577	14.770±ab0.577	7.950±0.577a	±7.5000.577
Second (T2)	45.450± 0.577 c	19.350 ±0.577b	13.9500.577 ±b	8.000 ± a0.577	7.570 ± a0.577
Third (T3)	62.210±a0.577	30.000±0.577a	16.210 ± a 0.577	7.690 ± a 0.577	6.810 ± 0.577a
Significance level	*	*	*	N.S.	N.S.

*: Significance level p<0.05, **: p<0.01, Non-significant.
Averages that carry more than one letter within a single column indicate a significant difference.

Table 10
Effect of the cultivation basin on the feature of protein efficiency rate within the cultivation months

Arithmetic average ± standard error

Basin /Month	October	November	December	January	February
First (T1)	±52.630.560 b	29.120.587± a	0.577± Ab 14.77	0.733±7.95 A	7.50±0.577 A
Second (T2)	0.577± c 45.45	0.621±19.35 b	13.95±B 0.577	0.565 ±8.00 A	0.578±7.57 A
Third (T3)	61.210.671 a ±	±30.000.577 a	16.21±0.622 A	7.69 ± 0.773 A	0.577±6.81 A
Significance level	*	*	*	N.S.	N.S.

*: Significance level p<0.05, **: p<0.01, Non-significant.
Averages that carry more than one letter within a single column indicate a significant difference.

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