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# The Chemical Composition of Artificial Diets and Meat of Common Carp (*Cyprinus carpio*) Reared in Earthen Ponds in Kirkuk Governorate, Iraq

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**Abstract:** This study was conducted in the laboratories of College of Agriculture/ University of Kirkuk for assessment of fish production in earthen ponds in Kirkuk governorate by studying some biological, physiological and growth performance, chemical composition of fish meat and the diets used in production. A survey of the earthen ponds where fishes were reared in Kirkuk governorate was conducted. Fish samples were collected from five earthen ponds in different locations in Kirkuk governorate. This study was conducted from 21/12/2015 till 21/2/2016. Fishes were harvested by using fishing hooks, beach seine net and cast net. Fishes were transported in cork containers and then were transferred directly to the Animal Resources Laboratory for further analyses. Protein in the fourth pond was significantly higher than that of the other ponds. Fishes of the fifth pond were higher in fat ratio (7.90%) than fishes of other ponds. Ash showed significance in fishes of the fifth pond (1.50%) in comparison with the first and second ponds. The statistical analysis of feeds used in the studied ponds showed that the first pond was significantly high in moisture and the second and third ponds were high in each of protein and fat while the ash was high in the fourth pond.

Keywords: Common carp, Feeds, Chemical composition, Kirkuk.

## INTRODUCTION

The world in these years is facing a real crisis in the provision of meat for human consumption due to the increase in population on the one hand and rising health and social awareness on the other hand, and

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as the food shortage problem tended the attention of the developed world to increase production and the search for new food sources, perhaps the most striking phenomenon of the food shortage is the lack of protein and their high prices (Al-Bahadly, 2011). Carp is one of the most important economic fish widespread in inland water bodies. It is the main breeding fish in Iraqi fish farms because of its high production rates, its resistance to any changes in different environmental conditions, easy cultivation and its wide food spectrum (Al-Garawe, 2012).

Fish farming currently covers 50% of global fish production. It is expected to rise in the future to meet the requirements of demand growth and rising consumption levels as indicated for export in 200 countries during 2012, representing 10 % of total agricultural exports and 1% of global trade, where the exports attained 25% of its value in 1976 and grew to 37% in 2012 (Al-Refaiee, 2016).

Fish farming industry faces many difficulties such as the lack of information of the symptoms of low dissolved oxygen, high/ low pH and high salinity, lack of knowledge about natural food in fish farms, type and quantity of feed given to the farmed fishes, poor quality of fingerlings, lack of coordination between producers and market, lack of information of prevention of diseases in fish farms and the high purchased fingerlings which compete with fish importer (Kshash, 2012). The knowledge of the chemical composition of important economic fishes is one of the most important of the main objectives to increase fish production and in particular those with high nutritional value (Al-Habbib et al., 1986). The study of the chemical composition of fishes is an important aspect by which to determine the nutritional value of fishes (Al-Khafaje et al., 2008).

The problems facing fish farming industry in the province of Kirkuk are similar to the problems in whole Iraq. These problems include the difficulty of the procedures for obtaining the official license for constructions of fish farms and thus the absence of the role of the agricultural guidance in the development of fish farms as well as the poor government support for projects of fish farming in addition to the high costs of fodder needed to feed the fishes, the heterogeneity of the granulated feed and lack of feed fish balanced and acceptable specifications. All such problems prevent cultured fishes to reach the ideal weight upon marketing against the high costs of setting up fish farms. So this study was aimed to determine the chemical composition of artificial diets and meat of the common carp (*Cyprinus carpio*) reared in earthen ponds in order to conclude on the carp production in Kirkuk governorate.

## MATERIAL AND METHODS

Fish samples were collected from five earthen ponds in different locations in Kirkuk governorate. The first pond was located in southeast of Kirkuk center, the second and third ponds were in northwest at about 40 km far from Kirkuk, near a fodder manufacture and about 50 km from Erbil, the fourth pond was in the north-west of the city of Kirkuk at about 20 km far from the province of Kirkuk and the fifth pond was at about 19 km southeastern of the city of Kirkuk.

The study was started from 21/12/2015 till 21/2/2016. From each pond, 10-11 fishes were used. The fishes were harvested by using fishing hooks, seine net and cast net. Fishes were transported via cork containers and then transferred directly to the Animal Resources Laboratory for further analyses. Fish meat and diets were analyzed by the procedure mentioned in New (1987). Determining fat, moisture, protein and ash was done according to the equations mentioned by Al-Aswad (2000).

The body weight gain as gm/fish, relative weight gain and specific growth rate were estimated according to the following equations:

Weight gain (gm/fish) = Mean of weight (gm) at the end of the experimental period – weight (gm) at the beginning of the experimental period.

Relative weight gain (RWG %) = Gain/ initial weight x 100

Specific growth rate (SGR) = (In $W_1$ – In $W_0$) / T) x 100 (Utne, 1979) where $W_1$= final weight, $W_0$ = initial weight, T = time between $W_1$ and $W_0$.

The statistical analyses were done following SAS (2001).

## RESULTS

The statistical analyses showed an increase in moisture of fishes of the third pond (74.62%) over fishes of the first pond (Table 1) and without any significant differences with fishes of the second, fourth and fifth ponds. Higher ratio of protein (17.50%) was observed in fishes of the fourth pond over fishes of the fifth pond and they did not differ significantly ($p < 0.05$) from fishes of other ponds. The statistical analyses of fat (Table 1) showed that fishes of the fifth pond were higher (7.90%) over the second, third and fourth ponds but without any significant variations with fishes of the first pond. Ash ratio in fishes of the fifth pond (1.5%) was significantly higher than those in other treatments.

Table 1: Chemical composition of the common carp meat reared in different ponds in Kirkuk governorate.

| Ponds | Protein | Fat | Ash | Moisture |
|---|---|---|---|---|
| 1 | 17.40 ± 0.22$^{a}$ | 7.70 ± 0.33$^{a}$ | 1.02 ± 0.06$^{c}$ | 73.33 ± 0.27$^{b}$ |
| 2 | 17.20 ± 0.23$^{a}$ | 6.70 ± 0.21$^{b}$ | 1.15 ± 0.09$^{cb}$ | 74.42 ± 0.40$^{a}$ |
| 3 | 16.70 ± 0.27$^{a}$ | 6.80 ± 0.30$^{b}$ | 1.24 ± 0.09$^{abc}$ | 74.62 ± 0.25$^{a}$ |
| 4 | 17.50 ± 0.23$^{a}$ | 6.34 ± 0.30$^{b}$ | 1.40 ± 0.11$^{ab}$ | 74.12 ± 0.30$^{ab}$ |
| 5 | 15.90 ± 0.40$^{b}$ | 7.90 ± 0.40$^{a}$ | 1.50 ± 0.16$^{a}$ | 73.94 ± 0.54$^{ab}$ |

Mean values with different superscripts within a column differ significantly (P≤0.05).

According to the results shown in Table (2), both protein and fat in feed diets of the second and third ponds (38.6 % protein and 8.52% fat) were significantly higher than those of feed diets of other ponds. The feed diets used in the fifth pond was significantly higher in ash (8.74%), the moisture in the first pond (17.32%) was significantly higher than those in other ponds, while the carbohydrates percentage in the fourth pond (58.52%) was significantly higher than those in feed diets used in the remaining ponds.

The protein ratio in the feeds used in the studied ponds (Table 3) was different and significantly affects weight gain of reared fishes in which the higher weight gain (1180 ± 62.01) was obtained in fishes of the fifth pond, but higher specific growth rate and higher relative growth rate was obtained from the fourth feed in comparison with the remaining treatments.

Table 2: Chemical composition of diets used in different ponds in Kirkuk governorate.

| Ponds | Protein | Fat | Ash | Moisture | Carbohydrates |
|---|---|---|---|---|---|
| 1 | 29.70 ± 1.50$^{b}$ | 5.60 ± 0.14$^{b}$ | 4.80 ± 0.22$^{b}$ | 17.32 ± 0.43$^{a}$ | 42.61 ± 1.61$^{b}$ |
| 2 | 38.60 ± 1.70$^{a}$ | 8.52 ± 0.56$^{a}$ | 3.91 ± 0.032$^{c}$ | 9.12 ± 0.18$^{c}$ | 39.90 ± 2.13$^{b}$ |
| 3 | 38.60 ± 1.70$^{a}$ | 8.52 ± 0.56$^{a}$ | 3.91 ± 0.032$^{c}$ | 9.12 ± 0.18$^{c}$ | 39.90 ± 2.13$^{b}$ |
| 4 | 19.13 ± 0.15$^{c}$ | 6.27 ± 0.92$^{b}$ | 5.05 ± 0.040$^{b}$ | 11.03 ± 0.16$^{b}$ | 58.52 ± 0.12$^{a}$ |
| 5 | 14.50 ± 0.40$^{d}$ | 5.60 ± 0.37$^{b}$ | 8.74 ± 0.10$^{a}$ | 10.60 ± 0.06$^{b}$ | 60.70 ± 0.30$^{a}$ |

Mean values with different superscripts within a column differ significantly (P≤0.05).

Table 3: Effect of protein ratio in artificial feed on common carp growth performance of different ponds in Kirkuk governorate.

| Protein ratio | Fish ponds | Weight gain | Specific growth rate (%) | Relative growth rate (% gm/day) |
|---|---|---|---|---|
| 29.70 | 1 | 730 ± 118.66$^{b}$ | 730 ± 118.66$^{b}$ | 0.58 ± 0.04$^{c}$ |
| 38.60 | 2 | 537.75 ± 129.66$^{b}$ | 1250.25 ± 112.50$^{b}$ | 0.79 ± 0.08$^{b}$ |
| | 3 | | | |
| 19.13 | 4 | 88.27 ± 6.64$^{c}$ | 9227.27 ± 664.57$^{a}$ | 1.09 ± 0.02$^{a}$ |
| 14.50 | 5 | 1180 ± 62.01$^{a}$ | 1180.00 ± 62.01$^{b}$ | 0.52 ± 0.00$^{c}$ |

Mean values with different superscripts within a column differ significantly (P≤0.05).

## DISCUSSION

Awwad (2013) showed that the moisture ratio in the common carp flesh reached 75.01% by using 200 mg/kg L carnitine and this agrees with the results of the present investigation. The ratio of moisture reported by Al-Khalaf & Khret (2014) was 76.61%. The results of the present study disagree with the results of Awwad (2013). These differences are due to the environmental variations, physiological status, fish age and food types (Mahdi et al., 2006).

The effect of protein ratio in fish diet to their growth performance which is explained by weight gain and growth rate (both specific and relative) and it significantly affects these parameters. The requirement of common carp of protein for best growth was determined as 310-380 gm/km diet (Ogino & Saito, 1970) and this disagrees with that mentioned by Al-Tameemi (2015) where the best utilization of protein was at the ratio of 29.34%. Higher growth in the common carp was obtained by Al-Jader & Al-Sulevany (2012) from fishes fed with 30% protein.

## REFERENCES

Al-Aswad, M.B. (2000). Meat science and technology, 3rd edition. Dar Al-Kutub for Publishing, University of Mosul: 139 pp. (In Arabic).

Al-Bahadly, R.H. (2011). Culturing of different stocking density of common carp *Cyprinus carpio* L. 1758 in floating cages in Missan governorate marshes. M. Sc. Thesis, Coll. Agric., Univ. Baghdad: 193 pp. (In Arabic).

Al-Garawe, A.H. (2012). Effect of diet type on secretion of some digestive enzymes and growth of *Cyprinus carpio* L. Ph. D. Thesis, Coll. Agric., Univ. Baghdad: 110 pp. (In Arabic).

Al-Habbib, O.A.; Saleh, W.A. & Hamed, K.M. (1986). Seasonal variation in the biochemical composition of the skeletal muscle of the freshwater fish *Barbus barbulus*. J. Biol. Sci. Res., 17(1): 219-225.

Al-Jader, F.A.M. & Al-Sulevany, R.S. (2012). Evaluation of common carp *Cyprinus carpio* L. performance fed at three commercial diets, Mesopot. J. Agric., 40(4): 20-26.

Al-Khafaje, B.Y.; Maktuf, A.A. & Abdul-Karim, H.M. (2008). Notes on chemical composition of four species of fishes from Al-Hammar marsh, in the south Iraq. J. Thi-Qar Sci., 1(1): 2-10. (In Arabic).

Al-Khalaf, W.S. & Khret, R.H. (2014). Chemical composition and extruded fat from some types of fresh and marine fish from Syria. Jor. J. Agric. Sci., 10(3): 611-620.

Al-Refaiee, I.H. (2016). Replacement of commercial dry yeast (*Saccharomyces cerevisiae*) with animal protein concentrate and its effect in growth and blood characteristic, some biological and chemical parameters and panel test for fingerlings of common carp *Cyprinus carpio* L. M. Sc. Thesis, Coll. Agric., Univ. Al-Anbar: 111 pp. (In Arabic).

Al-Tameemi, R.A. (2015). Evaluation of five commercial diets used for fish feeding in Basra governorate, southern Iraq, Iraqi J. Aquacult., 12(1): 71-82.

Awwad, M.I. (2013). Effect of adding l- carnintine to diet on growth and some blood parameters of common carp *Cyprinus carpio* L. M. Sc. Thesis, Coll. Agric., Univ. Baghdad: 45 pp. (In Arabic).

Kshash, B.H. (2012). Problems of fish farming in Babylon province, Euphrates J. Agric. Sci., 4(4): 211-221. (In Arabic).

Mahdi, A.A.; Al-Selemi, A.H.K. & Al-Saraji, A.Y.J. (2006). Nutritional value of some Iraqi fishes. Mar. Mesopot., 22(2): 239-253.

New, M.B. (1987). Feed and feeding of fish and shrimp. A manual on the preparation and presentation of compound feeds for shrimp and fish in aquaculture. FAO, ADCP/REP/ 87/26: 275 pp.

Ogino, C. & Saito, K. (1970). Protein nutrition in fish. I. The utilization of dietary protein by young carp. Bull. Jap. Soc. Sci. Fish., 36: 250-254.

SAS Institute (2001). SAS User's Guide: Statistics version 6, 12th edition. SAS Institute Inc., Cary, N. Carolina.

Utne, F. (1979). Standard methods and terminology in finfish nutrition. Proc. Symp. Finfish Nutrition and Fishfeed Technology, Hamburg: 20-23 June 1978: 437-443.