

EFFECTS OF FEEDING FREQUENCY ON SOME PHYSIO- BIOLOGICAL PARAMETERS OF COMMON CARP (*Cyprinus carpio*)

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ABSTRACT

In present study the effect of feeding frequency on some health aspects (biological parameters) of fingerling of common carp were investigated. Three groups of common carp (average weight 4.31 ± 0.1 g) designed with three feeding frequencies one meal a day (D1), two meals a day (D2) and three meals a day (D3) with three replicates of each treatment. Fish in experimental treatments were fed by 4% of body weight. No significant differences observed in Hepatosomatic Index, Gill Index and muscle ratio (Weight without Viscera and Weight without Viscera & Head) in all feeding frequencies, feeding one and two time per day were significantly higher than three times/ day in each of Kidney index and Spleen Index. Intestine weight index was significantly higher in T2 and T3, Intestine Length Index was higher significantly in T3.

INTRODUCTION

Knowledge on food requirements of a species is one of the basic determinants of using that species in a broadly-understood aquaculture. Previous research has demonstrated that the fish growth rate is depend not only on the feed chemical composition, but also on the manner of food is administered (manual, automatic), feeding frequency, feeding period, and feed ration (1).

Feed is generally the highest variable costs at aquaculture facilities. Understanding nutrition requirements and feeding strategies can reduce waste and increase profits. Feed efficiency is vital in livestock farming in general and of course, in the case of aquaculture. From a management standpoint frequent feeding (number of feeding per day) of fish may not be economical due to increased labor costs (2). So, one of the problems in fish production is to obtain a good balance between fish growth and food consumption. Therefore, it is equally important to know the growth and nutritional needs of fish, as knowing the best feeding strategies for a species (3).

Many studies have been conducted relating optimum feeding frequencies with growth, feed utilization, and survival in cultured fish. Frequent feeding generally improved growth, but there are contrary reports. Some studies have focused on the possible effects of different feeding schedules on body composition (4).

Despite the great potential of common carp production, information regarding the effects of feeding strategies and management practices on fish health aspects is limited, For these reasons, the present study aimed to investigate the effect of different feeding regimes (frequency of feeding per day) on health aspects (Biological parameters) of common carp.

MATERIALS AND METHODS

This experiment was carried out in the fish laboratory of the University of Sulaimani, College of Agricultural Sciences, Department of Animal Sciences, in Bakrajo. Three Glass aquariums were used representing three treatments. Glass aquarium with three partitions, each one represent a different treatment and replicate.

The experiment was conducted for 65 days using 45 common carp *Cyprinus carpio* L. which was brought from a local pond located in Qaladzya. Forty five common carp fingerlings with average weight of (T1: 22.88 gm T2: 21.08 gm T3: 21.32 gm) were distributed evenly among nine glass aquarium cleaned by suction daily, where approximately 10% of the water in the aquaria was replaced daily. three type of feed frequencies used which was representing three treatments, treatment number one (T1) consist of one time feeding only which the whole feed was given to the fish, treatment number two (T2) consist of two time feeding daily which the feed was divided in to two parts, treatment number three (T3) consist of three time feeding and the whole feed was divided into three parts.

At the end of the experiment, fish in each replicate treatment groups were counted and weighed. Fish sampled were collected randomly from each aquarium and used for anatomical measurements including Hepatosomatic Index, Gill Index, muscle ratio (Weight without Viscera and Weight without Viscera & Head), Kidney index, Spleen Index, Intestine weight index and Intestine Length Index. Biological parameters were defined as follows:

Hepatosomatic Index = Liver weight / Body weight *100

Gill Index= Gill weight / Body weight *100

Weight without Viscera= Body weight without Viscera / Body weight *100

Weight without Viscera & Head = Weight without Viscera & Head weight / Body weight *100

Kidney index = Kidney weight / Body weight *100

Spleen Index = Spleen weight / Body weight *100

Intestine weight index = Intestine weight / Body weight *100

Intestine Length Index = Intestine Length / Body Length *100

Analysis of variance was conducted using the general linear models (GLM) procedure of XLSTAT. Pro. 7.5 One way CRD (ANOVA). Fisher's L.S.D test's was used to compare between means of the experiment treatments.

RESULTS AND DISCUSSION

No significant differences observed in Hepatosomatic Index, and Gill Index in all feeding frequencies, feeding one and two time per day were significantly higher than three times/ day in each of Kidney index and Spleen Index as shown in table (1).

Table 1: effect of feeding frequency on some physio-biological parameters of common carp *Cyprinus carpio* L.

Treatments	Hepatosomatic Index	Gill Index	Kidney index	Spleen Index
T1	2.257 a ±0.236	5.318a±0.183	0.978 a ±0.243	0.796 a ±0.124
T2	2.074 a ±0.268	5.432 a±0.140	0.850 ab ±0.237	0.798 a±0.176
T3	2.457 a ±0.292	5.892 a±0.087	0.555 b ±0.190	0.345 b±0.183

The hepatosomatic index varied greatly in response to feeding frequency, as observed by (4). Cultured common carp is characterized by high lipid deposition in their flesh. The suppression of lipid deposition is a problem to be overcome in the culture of carp to allow a reduction of dietary protein and to improve carcass quality.

Fish of group (4 times feeding) had significantly higher hepatosomatic index than fish of other group, but different feeding frequencies did not produce a corresponding change in muscle ratio, Gonadosomatic index, the percentage lipid of hepatopancreas tended to decrease with increasing feeding frequency in the study of (4),

A higher feeding frequency might suppress lipogenesis and the lipogenic pathway. Excessive lipid accumulation is associated with general overnutrition. When fish are fed at infrequent intervals, they receive a large quantity of food at each feeding. Although the digestive tracts are too small to accommodate the large quantities of food, lipogenesis might be activated, and lipid accumulation might thus be increased as obtained by (4).

Table (2) show that Intestine weight index was significantly higher in T1 and T2, Intestine Length Index was higher significantly in T3.

Table 2: Effect of feeding frequency on Intestine wt. Intestine Length Index of common carp *Cyprinus carpio* L.

Treatments	Intestine wt. Index	Intestine Length Index
T1	3.557 ab \pm 0.157	133.917 b \pm 0.050
T2	4.384 a \pm 0.086	133.928 b \pm 0.050
T3	3.384 b \pm 0.151	162.581 a \pm 0.116

Data on muscle ratio (Weight without Viscera and Weight without Viscera & Head) were used to calculate the amount of muscle and the results are illustrated in table (3). No significant differences observed between fish fed two and three times per day.

Table 3: effect of feeding frequency on Weight without Viscera and Weight without Viscera & Head Index of common carp *Cyprinus carpio* L.

Treatments	Weight without Viscera	Weight without Viscera & Head
T1	84.545 a \pm 0.031	62.905 a \pm 0.055
T2	83.867 a \pm 0.027	59.059 a \pm 0.097
T3	86.507 a \pm 0.022	61.923a \pm 0.018

Increased feeding frequency actually led to greater overall food intake. However, higher feeding frequency did not always improve growth, as indicated by (4). Therefore, it appears that higher feeding frequency suppressed lipid accumulation in muscle, as observed in red spotted grouper *Epinephelus akaara*(5).

The study of (6) shows that several feeding frequencies are better than few feeding frequencies. Therefore, they recommended that the feeding of common carp juveniles be done three times daily for optimum growth.

Increasing frequency in the fish feeding results in a better food accessibility reducing feed competition stress leading to a better growth performance. The success of angel fish culture depends on effective feeding frequency. A feeding frequency of two and four times a day compared to other experimental groups seemed sufficient for effective growth and nutrient utilization (7). The best results in the study of (8) growth performance and survival rate were obtained by feeding four meals a day as the final body weight and specific growth rate (SGR) were significantly higher in group feeding four meals in this comparison. Similar responses were observed for body weight increased and daily growth rate. The best feed conversion ratio (FCR) was obtained from four daily feeding.

The body weight and length of fish fed twice daily or three times daily were similar (9). This was found also in the weights of the stomach, intestine, hepatopancreas and digestive tract due to the fact that the successive growth of fish is come by the volume of the gastrointestinal tract for the digestion, absorption and utilization of nutrients (10).

The feeding frequency had a significant effect on the growth performances of sex-reversed Nile tilapia. Feeding management with two meals daily was appropriate for practical use in this species. This was in agreement with the optimal feeding frequency reported for the larval to juvenile stages of hybrid tilapia (*O. niloticus* _ *O. aureus*) by (11).

Fish fed more than twice a day showed a general elevation in the amylase activity compared to the once daily group, though it was not significant. However, no differences were observed in fish fed two and three meals daily. This was in agreement with the unchanged amylase activity reported in juvenile hybrid tilapia (11) and large yellow croaker (12) after feeding at different frequencies.

Regarding the protein-digesting enzymes, fish fed at a proper longer frequency had similar activity levels of total proteases, trypsin, chymotrypsin and the T/C ratio compared to those receiving three meals daily. These stable activities indicated unchanged protein digestion in the intestine, suggesting that tilapia appear to have the capacity to adjust their digestive proteases to a range of 2e3meals daily. For fish fed less often, the significantly decreased chymotrypsin activity might negatively affect the protein utilization in this group (9).

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