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EFFECT OF DIFFERENT SUPPLEMENTARY FEEDS ON THE GROWTH OF COMMON CARP (*CYPRINUS CARPIO*)

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ABSTRACT

The present experiment was conducted in a rectangular aquarium for three months to evaluate the growth performance of common carp (*Cyprinus carpio*). Growth performance of Common Carp were studied under four different feed supplements i.e. Feed contained Rice and Wheat bran (CG), Fish meal (T_1), Poultry meal (T_2) and waste proteins (T_3). These four different supplementary feed were supplied to fish which were kept in four different tanks at Aquarium (Fisheries Lab) in Zoology department UAJ and K Muzaffarabad, at the rate of 0.25 gm/per day. Initially, at the time of stocking, the morphometric characteristics, viz, average body weight and average body length was measured. After initiation of experiment, these morphometric characteristics as well as physico-chemical parameters (pH and water temperature) of the water were recorded on daily basis throughout the study period. Average Body weight of Common Carp was recorded as, 13.91±1.592, 10.88±0.617, 11.96±0.967, 10.841±0.725 gm under treatment T_1, T_2 and T_3 and Control group respectively. The final body weight of fish in Control group and treatment groups showed that fish kept in T_1 (P-Value=0.003) have gained the maximum body weight, while other treatment groups showed no significant statistical difference. Final Body Length of Common Carp was recorded as 7.44±0.169, 11.28±1.407, 8.031±0.473, 9.293±1.490cm under Control group, T_1, T_2 and T_3, respectively. The final body length of fish in Control group and treatment groups showed that fish kept in T_1 (P-Value = 0.001) gained more length followed by T_3 (P-Value = 0.007). There is no significant statistical difference in Control group and T_2. These results suggest that T_1 containing the 30% wheat and rice bran supplementary diets can increase the fish maximum body weight and body length.

Keywords: aquarium, common carp, growth performance, physico-chemical, polyculture

INTRODUCTION

The *Cyprinus carpio* is a first fish species which is superficially and apparently distributed and expanded extensively as introduced by human since the Romans familiarized it from the river Danube in all over Europe (Balon, 1995). Common carp, the most common cyprinid species that generates a significant part of inland freshwater fish production, is introduced to inland waters such as lakes, dam lakes and streams in different regions (Vilizzi and Tarkan, 2015). Aquaculture is important as most of the fish being utilized by human are produced from it globally (Naylor *et al.,* 2009). Owing of the cost and rate of fish feed is increased critically in the previous era leads to hinder the development of aquaculture as well as utilization of good quality feed (Hardy, 2010). In India, about 85% of the entire aquaculture production is contributed by the carps (Laxmappa, 2014). Fish feed is essential as the production and growth of fish depends on the constituents and composition of fish feed. The studies of Gaylord *et al.,* 2010); Gui *et al.,* 2010) and Kumar *et al.,* 2010) revealed that fish meal is an important component of fish feed because of its nutritional constituents like amino acids, fatty acids, vitamins, and minerals which improve rate and efficiency of growth as well as quality and value of meat.

Due to persistently rising in global population and more demand of nutritional assets particularly natural protein, aquaculture still significantly contributes in order to overcome the shortage of food worldwide. The price of feed signifies an imperative quantity of operative

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expenses of aquaculture. Protein resources are definitely the main contributing factors in expenses of feed in aquaculture. Fish meal is the favored nutritional protein source for various cultivated shrimp and fish species due to its amino acid stability, vitamin constituents, deliciousness and mysterious growth promoting reasons (Majumdar, Deb and Nath, 2014).

Substantial improvement in fish diet has been attained by expending extruded and pelleted feeds. These alimentary supplements have greater digestibility, resultant in a lesser ratio of feed transformation and a decrease in extreme discharge of nutrients into the development method (Hardy and carp aquaculture as they deliver a larger level of mass improvement (Ciric, Subakov-Simic, Dulic, Bielanovic, Icovacki and Markovic, 2015).

The aquaculture and fish production sector in Pakistan has shown significant growth in recent years. According to the Food and Agriculture Organization (FAO), the global aquaculture production in Pakistan has been increasing steadily, with the production of fish reaching 164,527 tonnes in 2021, up from 159,083 tons in 2018. The Fisheries Development Board (FDB) also reports that Pakistan's aquaculture production increased more than tenfold, from 12,485 metric tons in 2000 to 157,469 metric tons in 2017, and the sector has been growing at an average rate of 6% annually. This growth is attributed to the country's long coastline, large inland water resources, and a growing demand for fish. The government of Pakistan has recognized the importance of aquaculture in meeting the growing demand for seafood and has been focusing on the development of the fisheries and aquaculture sector. With the right policies, investments, and support, Pakistan has the potential to become a major player in the global aquaculture industry, contributing to food security, employment generation, and economic development. Therefore, the current scenario of aquaculture and fish production in Pakistan reflects a positive outlook with significant potential for further growth and contribution to the economy and food security.

In this research work the effect of different supplementary feeds on growth of *C. carpio* was analyzed. At Chakar Muzaffarabad, there run a semi intensive culturing of *C. carpio*. They fed *C .carpio* by rice bran and wheat bran only and obtained a very slow growth. Therefore, the research work is designed to feed the *C. carpio* by three other food supplements, to enhance their growth. It focused on comparative analysis of feed given at pond and elevation of efficacy of self-formulated feed for growth of Common carp and, to evaluate its growth rate by means of length, weight and survival rate.

MATERIALS AND METHODS

Experimental fish

C. carpio was selected for the present experiment. The reason of its selection was that it has excellent growth rate, easy availability, wide distribution, commercial importance etc. It is highly tolerant fish. It can better survive in a variety of aquaculture habitats. Its seeds are extensively used by aqua-farmers for variety of purposes such as monoculture and polyculture.

Experimental design

Common carp fingerlings were collected from Chikar fish hatchery of fisheries department Govt. of Azad Jammu and Kashmir (District Hattian Bala) for the proceedings of research work. Chikar fish Hatchery is located at the altitude of 1607 meters (5,272 ft). The Geological coordinates shows that it is 34.1489ºN 73.6755ºE. In Chikar fish hatchery the fishes are fed mainly with Rice bran and wheat bran. In present research work the aquariums were filled with 75 liter fresh water. The physical parameters like pH and water temperature were measured routinely to keep pH and temperature at optimal range of common carp. Water temperature was taken in ºC by using Walk LAB Microcomputer Thermometer IN 9000 (0ºC-100ºC). For the measurement of water temperature electrode was dip into the water for about three minutes. Wagtech pH meter was used to check the pH of water tanks. The pH meter was first intended with buffer solution by dipping the electrode of pH meter into the buffer solution then the electrode of pH meter was immersed into the water sample whose pH was to determine during the study period.

Feed treatment

Different feeds were used for common carp in aquarium to check the effect of feed on the growth of common carp. For this purpose, the fish divided into 4 groups randomly and named as control group and the other three experimental (treatment) groups, named as T_1, T_2 and T_3. Likewise, 3 different types of feed with 30% crude protein synthesized and used as treatment (Table 1).

Table 1. Composition of different feed ingredients used in preparing fish feed in different treatments

Ingredients	T_1	T_2	T_3	Control G
Fish meal	30%	30%	30%	0%
Wheat and Rice bran	30%	15%	15%	50%-50%
Soya bean	20%	20%	20%	0%
Wheat floor	10%	10%	10%	0%
Multi vitamins	02%	02%	02%	0%
Sunflower oil	04%	04%	04%	0%
Moisture	04%	04%	04%	0%
Poultry meal	0%	15%	0%	0%

After taking initial total body length (6.83 cm) and total body weight (8.35 g), 10 fish samples were randomly selected for each treatment and control group. Control group was fed by normal feed which consist of 50% Rice bran and 50% Wheat bran as used in fisheries Chakar hatchery. After feeding, fortnightly weight and length of randomly selected fish measured by using electrical weighing balance and by using compass and ruler, respectively.

Statistical Analysis

Analysis of data was done by 'two sample T-test' using Minitab Software.

RESULTS AND DISCUSSION

pH

pH has a great effect on the growth performance of common carp. The best for fish culture is that which is neutral or slightly alkaline with a pH from 7.0 to 7.5 (Pandey and Shukla, 2005). In the start of this research pH values of control group and treatment groups were slightly alkaline and these values gradually reduced to neutral, which shows that Common carp have maximum growth at neutral and slightly alkaline pH. The maximum pH values were recorded in the month of January in T_1 while lowest values were in the month of March in T_3. The average values of pH of Control group during research work was 7.83±0.204, T_1 (7.78±0.268), T_2 (7.61±0.132) and T_3 (7.46±0.154) respectively. Variation in pH of Control group and treatment groups are shown in Table 2 and Figure 1.

Table 2. Shows the variations of pH in control group and experimental groups throughout the study period from January 2018 to March 2018.

Dates	Control group	T_1	T_2	T_3
01-01-18	8.4	8.5	8.2	8.3
16-01-18	8.3	8.5	7.9	7.8
01-02-18	8.1	8.1	7.9	7.8
16-02-18	7.6	7.3	7.5	7.3
03-03-18	7.4	7.2	7.3	7.1
19-03-18	7.2	7.1	7.2	7.0
Mean ± SEM	7.83± 0.204	7.78± 0.268	7.61± 0.132	7.46± 0.154

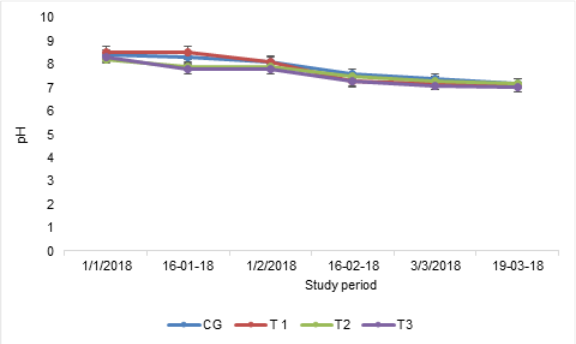

Figure 1. Shows the variations of pH in control group and experimental groups throughout the study period from January 2018 to March 2018.

Water temperature

Water temperature also has great influence on the growth of Common carp. The Common carp actively feeds when water temperature is above 18-20°C (Balon, 1995). though common carp with stand high water temperature about 28-30°C. The optimum temperature of growth is between 20-25°C. When water temperature is lower than around 15-16°C, Common carp feeds less and less intensive. Feeding cease, if water temperature falls about 8°C. At 5°C carp hibernates in groups in the mud of deeper waters (Chakraborti *et al.,* 1992). The water temperature of Control group and Treatment groups was increased gradually. The highest values of water temperature were recorded in the month of March in T_2 while lowest values were in the month of January in T_3. The average Water temperature of Control group (12.98±0.822), T_1 (12.7±0.735), T_2 (13.23±0.875) and T_3 (12.55±0.709). The variation of Water temperature throughout the study period is shown below in Table 3 and Figure 2.

Table 3. Shows the variations of water temperature in control group and experimental groups throughout the study period from January 2018 to March 2018.

Dates	Control group	T_1	T_2	T_3
01-01-18	10.00	10.00	10.00	9.9
16-01-18	11.4	11.4	11.6	11.6
01-02-18	13.00	12.6	13.3	12.3
16-02-18	13.5	13.2	14.00	13.00
03-03-18	14.5	14.00	14.5	13.5
Man± SEM	12.98± 0.822	12.7± 0.735	13.23± 0.875	12.55± 0.709

Total body weight gain

Average Body weight of Common Carp was recorded initially as 10.841±13.91±1.592, 10.88±0.617 and 11.96±0.967gm under Control group, T_1, T_2 and T_3 respectively. The average body weight gain after treatment was

11.94±1.027, 15.66±1.79, 11.56±0.72 and 13.06±1.104gm under Control group, T_1, T_2 and T_3 respectively. The total body weight gain of fish in Control group and treatment groups shows that fish kept in T_1 have gained the maximum body weight. There is no significant statistical difference in Control group, T_2 and T_3 but the statistical analysis of T_1 showed that significant difference is noted in the body weight of Treatment 1 fish than Control group fish weight (T-Value= -4.47 P-Value= 0.003 DF= 7). The variations in average body weight and total body weight gain in Control group and Treatment groups are shown in Table 4 and Figure 3.

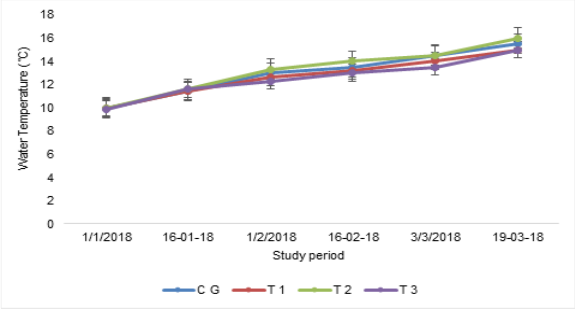

Figure 2. Shows the variations of water temperature in control group and experimental groups throughout the study period from January 2018 to March 2018

Table 4. Shows the variations of Total body weight in control group and experimental groups throughout the study period from January 2018 to March 2018

Dates	Control Group (Rice and Wheat Bran) Avg. Wt	Incr. Wt	T_1 (Fish Meal) Avg. Wt	Incr. Wt	T_2 (Poultry Meal) Avg. Wt	Incr. Wt	T_3 (Waste Prtein) Avg. Wt	Incr. Wt
01-01-18	8.35	8.35	8.35	8.35	8.35	8.35	8.35	8.35
16-01-18	9.47	10.57	11.00	13.65	10.00	11.65	10.37	12.39
01-02-18	10.61	11.75	13.12	15.24	10.87	11.74	11.67	12.97
16-02-18	11.07	11.54	14.98	16.84	11.67	12.47	12.86	14.05
03-03-18	12.55	14.03	17.16	19.34	11.97	12.27	13.51	14.16
19-03-18	13.00	15.45	18.85	20.54	12.45	12.93	15.00	16.49
Mean± SEM	10.84± 0.725	11.94± 1.027	13.91± 1.59	15.66± 1.79	10.88± 0.617	11.56± 0.72	11.96± 0.967	13.06± 1.104

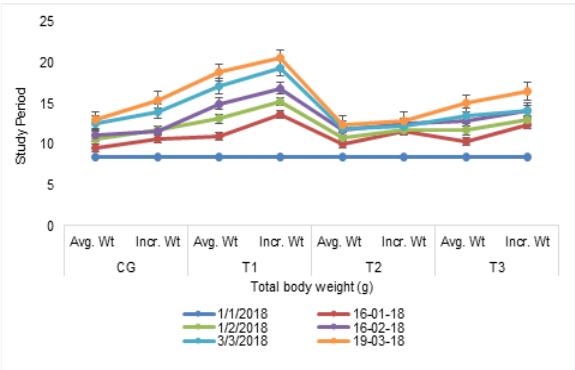

Figure 3. Shows the variations of total body weight in control group and experimental groups throughout the study period from January 2018 to March 2018.

Total body length gain

Average Body Length of Common Carp was recorded initially as 7.44±0.169, 11.28±1.407, 8.031±0.473, 9.293±1.490cm under Control group, T_1, T_2 and T_3 respectively. The average body length gain after treatment was 7.64±0.196, 12.79±1.648, 8.54±0.629 and 10.21±1.059cm under Control group, T_1, T_2 and T_3 respectively. The final body length of fish in Control group and treatment groups shows that fish kept in T_1 and T_3 have gained the maximum body length. There is no significant statistical difference in Control group and T_2 but the statistical analysis of T_1 and T_3 shows that there is a significant difference in the average body length gain of T_1 and T_3 fish than Control group fish body length gain. T_1 (T-Value = -7.94 P-Value= 0.001 DF= 4) , T_3 (T-Value= -5.12 P-Value= 0.007 DF= 4). The variations in average body length and total body length gain in Control group and Treatment groups are shown in Figure 4 and Table 5.

Table 5. Shows the variations of total body length in control group and experimental groups throughout the study period from January 2018 to March 2018

Dates	Control group (Rice and Wheat Bran) Avg Length	Inc Length	T_1 (Fish Meal) Avg Length	Inc Length	T_2 (Poultry Meal) Avg Length	Inc Length	T_3 (Waste Protein) Avg Length	Inc Length
01-01-18	6.83	6.83	6.83	6.83	6.83	6.83	6.83	6.83
16-01-18	7.17	7.51	8.17	9.51	7.00	7.17	7.35	7.87
01-02-18	7.42	7.67	10.65	13.13	7.55	8.10	8.63	9.91
16-02-18	7.52	7.62	12.17	13.69	8.17	8.79	9.77	10.91
-03-18	7.75	7.98	14.00	15.83	8.75	9.33	10.83	11.89
19-03-18	8.00	8.25	15.90	17.80	9.89	11.03	12.35	13.87
Mean± SEM	7.44± 0.169	7.64± 0.196	11.28± 1.407	12.79± 1.648	8.031± 0.473	8.54± 0.629	9.293± 1.490	10.21± 1.059

The water quality parameters obtained in the current study were not affected by the types of diets used. The water quality parameters obtained are comparable with those reported by Abdel-Tawwab *et al.* (2007), Rukera *et al.* (2012) and Oo *et al.* (2015) for *O. niloticus* reared in earthen ponds. The water quality parameters measured in the present study were within the optimum ranges required for survival and growth of *C. carpio*. The main water quality parameters for optimal survival and growth of fish are temperature ranging from 25.0 to 30.0°C, dissolved oxygen 4.0-8.0 mg/L and pH 6.5-9.0 (Suresh 2003; Hussain 2004; Shahabuddin *et al*., 2012). Although pH was slightly high (7.0 to 8.5). It was also reported that rice bran could be used for semi-intensive culture of fishes in fertilized ponds to boost the production based on its availability and low cost (Limbu *et al.,* 2016).

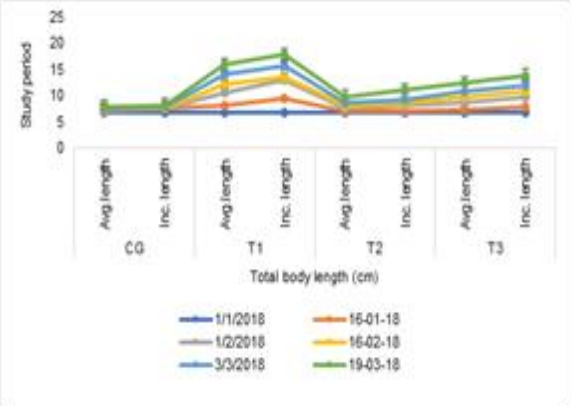

Figure 4. Shows the variations of total body length in control group and experimental groups throughout the study period from January 2018 to March 2018

CONCLUSION

Average Body weight of Common Carp was recorded as, T_1 followed by T_2, T_3 and Control group, respectively. There is no significant statistical difference in Control group, T_2 and T_3 but the T_1 showed that there is a significant difference in the body weight of T_1 fish than Control group fish weight. Similarly, Average Body Length of Common Carp was recorded as T_1, T_2, T_3 and Control group respectively. There is no significant statistical difference in Control group and T_2 but the statistical analysis of T_1 and T_3 showed that there is a significant difference in the body length of T_1 and T_3 fish than Control group fish weight. The different trends of increase in body weight and total length were observed for different feeding regimens. The artificial feed (T_1) prepared by Orizza is found to be the best for semi-intensive culturing.

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AUTHOR'S CONTRIBUION

A. A. Khan: Conceptulization of idea
T. Akhter: Conduct resesrch and wrote first draft
M. Ejaz: Data analysis
S. Sabir: Reviewed and finalized the manuscript
M. Shakil: Editing and Proof reading of manuscript

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