# Effect of Different Feed Ingredients on the Growth of Caged Common Carp

Ash K Rai*[1] and Jaya D Bista[2]

[1] Fisheries Research Division, Godawari, Lalitpur
[2] Fisheries Research Centre, Pokhara, Kaski

## Abstract

To know the effect of four different fish feed, nine months old common carp about 47 g size were stocked at the stocking density of 12 fish $m^{-3}$ in the cages and cultured in Lake Phewa for 175 days. Four different feed ingredients used were fish meal + soybean + oil cake + rice bran + wheat flour, fish meal + oil cake + rice bran + wheat flour, soybean + oil cake + rice bran + wheat flour and commercial cattle feed. The crude protein ranges from 23 to 32.2%. 32.2% protein content feed containing ingredients of fish meal + soybean + oil cake + rice bran + wheat flour was better for the fish growth (0.30 g $day^{-1}$) but was the lowest survival rate (65.4%) followed by 27.1% protein content feed containing fish meal + oil cake + rice bran + wheat flour (0.23 g $day^{-1}$). 26.2% protein content feed containing soybean + oil cake + rice bran + wheat flour without animal protein was the poorest growth rate (0.17 g $day^{-1}$) with the highest survival rate (95.7%) among the tested feed. It was observed that feed with higher protein level was better for the fish growth and the growth of the fish was different significantly among the treatments except the treatment fish meal + oil cake + rice bran + wheat flour and commercial cattle feed. The common carp fish cultured in cages through artificial feed was not satisfactory. It digs and burrows the pond embankments and sides in search of organic matter that makes pond turbid.

**Key words:** Cage fish culture, common carp, feed ingredients

## Introduction

Cage fish culture can be done either giving or without giving supplementary feed. It is easy to handle and can get higher production from limited area. Planktivorous fish species are commonly used for cage fish culture without giving supplementary feed in Nepal but the omnivorous common carp fish has not been practiced yet. Common carp was originated from the central Asia and introduced in ancient times into China and Japan (Okada, 1960). Now it is widely spread out all over the world. It is an omnivorous fish and can eat any digestible feed item. It eats zooplankton and phytoplankton during young stage and more than 10 cm size eats insects, decayed vegetable matter and bottom dwelling organisms, notably *tubificids, molluscs, chironomids, ephemerids and trichopterans*. It digs and burrows the pond embankments and sides in search of organic matter that makes pond turbid.

Common carp, an exotic fish, is very popular and fetch higher price than Chinese carp (silver carp and bighead carp) in Nepal. The artificial feed especially for common carp has not been developed yet in Nepal. The growth of this carp depends upon the local environment, cultural method, stocking density, quality and quantity of feed supplied. Alikunhi (1966) has reported that under given conditions, growth of common carp is different in different countries (300g in China, 400 g in Malaysia, Thailand, and Indonesia, 35-50 g in Europe and 15 g in England). The fish eats decayed pieces of plants, the young shoots of aquatic weeds and the natural food contains basically rich in animal protein. Common carp eats artificial protein-rich foodstuffs such as fish meal, blood meal, caracass meal, dried insects, silkworm pupae, flesh of mollusks, minced flesh of fish, frog and snake (Woynarovich, 1975). The growth of common carp was satisfactory by feeding on poultry feed pellets having about 20% animal protein and 10% vegetable protein content. The carp has its maximum appetite when the water temperature remains between 20-25$^{o}$C

and under 14°C the fish takes little food. Woynarovich (1975) reported that the carp gets daily food of about 5-6% of its body weight and grow fast (1 to 2% of the body weight per day).

Cage culture is a method of farming aquatic organisms in a particular type of rearing facility (Beveridge, 1987) and fish growth depends entirely on the external supply of high proteinous feed (> 20%). Cage fish culture is defined as the method of fish rearing from fingerlings to marketable size in enclosed cages that allow free circulation of water into and out of the cages (Kuronuma, 1968; Schmittou, 1970). This culture method is popular as it involves relatively low initial cost, easy to handle and easy to manage. It is simple technique and has simple management practice, which depends upon the feeding habit of fish species either giving supplementary feed or depending solely upon natural food available. Channel catfish production in cages is, at least, as profitable as other methods of rearing (Lowell, et al., 1982). Rearing of fish in cages is the most economical and comparatively profitable, although it depends very much upon availability of feed stuffs, feed cost and the local circumstances. Fish meal is expensive in Nepal and need to import from other countries. So, this study has been carried out to see the effect on the fish growth by feeding different feed containing different feed ingredients with and without supplemented fish meal.

## Materials and Methods

Eight floating cages (4- × 4- × 2-m) of 30 mm stretch mesh size were set in Lake Phewa at Pokhara valley. The cages were fixed with bamboo frames anchored in a straight line. Treatment was replicated twice. Each cage was covered from the top to prevent fish loss and predatory. Cages were set 2 m apart to allow free circulation of water in and out of cages.

Nine months old of about 47 g of common carp fish were stocked at the rate of 12 $m^{-3}$ and cultured for 175 days by feeding different feed ingredients having 26-32% crude protein including 23% in control commercial cattle feed. The fish were fed twice a day. The feed ingredients are given in Table 1. The feed were made pellet and fed at the rate of 4% body weight of fish. Twenty percent of fish were sampled monthly for their growth check-up. The water temperature was also measured during the fish sampling. Statistical analysis for significant differences among the experimental diets was determined by using analysis of variance.

## Results and Discussion

The fish fed with fish meal + soybean + oil cake + rice bran + wheat flour had better growth (0.30 g $day^{-1}$) followed by fish meal + oil cake + rice bran + wheat flour (0.23 g $day^{-1}$), commercial cattle feed (0.20 g $day^{-1}$) and soybean + oil cake + rice bran +wheat flour (0.17 g $day^{-1}$), respectively (Table 2). The survival rates was the highest (95.7%) when the fish were fed with soybean + oil cake + rice bran + wheat flour and it was the lowest (65.4%) with fish meal + soybean + oil cake + rice bran + wheat flour.

**Table 1. Composition of different feed ingredients used in preparing fish meal in different treatments (Trt)**

| Ingredient | Trt-I | Trt-II | Trt-III | Control |
|---|---|---|---|---|
| Fish meal, % | 20 | 25 | - | 0 |
| Soybean, % | 20 | - | 25 | 0 |
| Oil cake, % | 22 | 35 | 45 | 0 |
| Rice bran, % | 20 | 25 | 25 | 0 |
| Wheat flour, % | 18 | 15 | 5 | 0 |
| Commercial cattle feed, % | 0 | 0 | 0 | 100 |
| Mixed vitamin | 1 | 1 | 1 | 0 |
| Mineral | 1 | 1 | 1 | 0 |
| Crude protein | 32.2 | 27.1 | 26.2 | 23.0 |
| Crude fat | 17.0 | 18.9 | 9.3 | 2.8 |
| Ash | 7.4 | 7.4 | 5.5 | 10.7 |
| Moisture | 7.6 | 9.5 | 11.4 | 9.6 |

**Table 2. Mean weight, survival rate and growth rate of common carp fish cultured in cages and fed with different feed ingredients**

| Description | Trt-I | Trt-II | Trt-III | Control |
|---|---|---|---|---|
| Mean weight at stocking, g | 47.0 ± 4.2 | 46.5 ± 4.1 | 48.0 ± 3.3 | 47.0 ± 4.1 |
| Mean weight at harvest, g | 99.7 ± 4.4 | 86.5 ± 5.8 | 77.4 ± 5.1 | 82.7 ± 4.7 |
| Survival rate, % | 65.4 | 94.3 | 95.7 | 91.7 |
| Growth rate, g day$^{-1}$ | 0.30 | 0.23 | 0.17 | 0.20 |

The largest size of fish (99.7 ± 4.4 g) was obtained when fed with fish meal + soybean + oil cake + rice bran + wheat flour and the smallest size of fish (77.4 ± 5.1 g) was obtained when fed with soybean + oil cake + rice bran + wheat flour. The fish growth was higher when fed higher protein containing feed (32.2%) and lower growth when fed without having fish meal. The fish growth containing lower protein feed (23.0%) the commercial cattle feed was better than the fish fed having fish meal but contained higher protein level (26.2%).

The fish growth had no regular pattern though the growth of fish was less without fish meal than with fish meal (Fig. 1). The growth was very slow from Feb to April when water temperature was below 20$^{o}$C and it started increasing after April as the water temperature increased above 20$^{o}$C. The fish did not grow from May to June in Trt-I with very little growth in Trt-II (0.02 g day$^{-1}$) and in control (0.02 g day$^{-1}$). However the growth of the fish was significantly differences ($p < 0.001$) fed with different diets among the treatments except between the Trt-II and control. The growth pattern was better after June as the water temperature increased above 22$^{o}$C. The highest growth rate of the fish was 0.67 g day$^{-1}$ in June/July in Trt-I when fed with fish meal + soybean + oil cake + rice bran + wheat flour (Fig. 1).

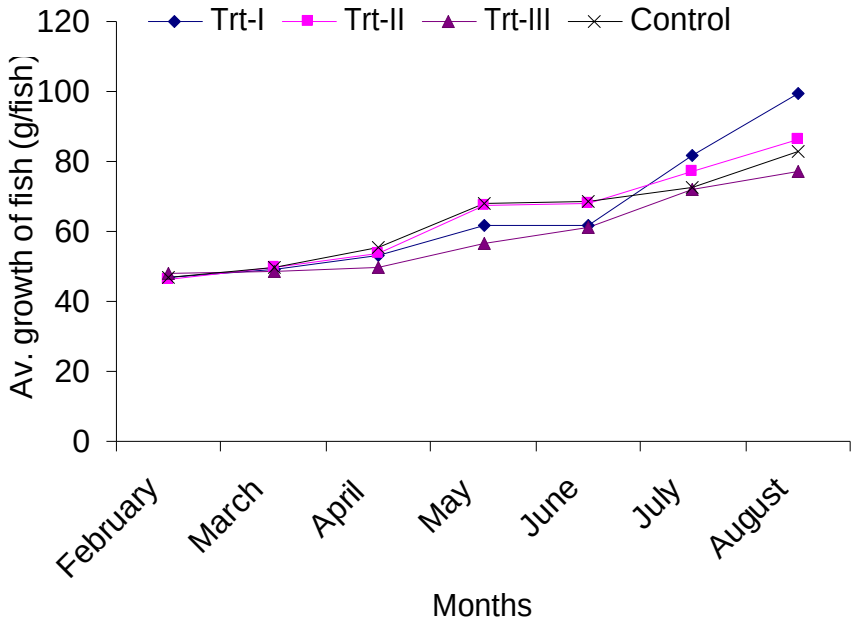


**Fig. 1. Monthly growth rate of caged common carp fed with different feed ingredients at Phewa Lake.**

Common carp are omnivorous fish and they eat any food, which can be digested. However, their habit are to dig and burrow into the soil in search of organic matter such as larvae of insects, worms, mollusks and decayed vegetable matters containing bottom dwelling organisms, pieces of plants, the young shoots of aquatic weeds, (Woynarovich, 1975; Jhingran and Pullin, 1985).

In case of suspended cage culture, common carp fish can't get their natural proteinous food except plankton available inside the cage. Therefore, the fish might not grow satisfactorily. It also indicates that the fish growth would be better when fed with higher protein containing feed especially animal protein. The fish growth was better when fed with cattle feed containing animal protein than the fish fed with higher protein containing feed without fish meal. It means that the fish need higher protein containing feed with necessary animal protein too. However the common carp did not grow satisfactorily in cage culture even the proteinous artificial feed is given which might be due to its scrapping nature in the bottom.

## References

Alikunhi, KH. 1966. Synopsis of biological data on common carp *Cyprinus carpio* (Linnaeus, 1958). Asia and Far East, *FAO Fish. Synop.* 31(1):73.

Beveridge, MCM. 1987. *Cage aquaculture*. Fishing news books Ltd. 1 Long Garden Wall, Farnham, Surrey, England. 352 pp.

Jhingran, VG and RSV Pullin. 1985. *A hatchery manual for the Common, Chinese and Indian major carps*. Asian Development Bank, International Centre for Living Aquatic Resources management. 191 pp.

Kuronuma, K. 1968. Carp culture in floating net cages in lakes. News systems and new fishes for culture in the Far East. FAO, *Fisheries Technical Paper* 44:123-142.

Lowell, E, SH Newton and EL Torrans. 1982. Caged catfish production in private farm ponds. *Arkansas Farm. Res.* 31(2):14-15.

Okada, Y. 1960. Studies on freshwater fishes of Japan. *J. Faculty of Fishery*, University of Mie 4 (2):267-588.

Schmittou, HR. 1970. Developments in the culture of channel catfish *Ictalurus puntatus* (Ref.) in cages suspended in ponds. *Proceedings of the Annual Conference*, Southeast Association of Game Fish and Commissioner 32:226-244.

Woynarovich, E. 1975. *Elementary guide to fish culture in Nepal*. FAO Rome.