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Comparative Study on the Growth Pattern and Enzyme Profile of *Labeo rohita* Fed with Supplementary Feed

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Abstract

Aquaculture plays an important role in generation of farmers income. Asia and pacific represents the most important region for fisheries and Aquaculture production an attempt has been made to study the growth performance of and enzyme profile of *Labeo rohita*. The study revealed that the supplement diet fed with *Labeo rohita* showed significant increase in the growth and enzyme status.

***Key words*:** *Labeo rohita,* Aquaculture, Supplement feed

Aquaculture is the fastest growing food producing sector in the world with greatest potential to meet the growing demand for food (FAO 2005). In contrast to other animal production sector. Aquaculture characterized by an enormous diversity of species raised both in natural and artificial systems. Aquaculture is the process of rearing, breeding and harvesting of the aquatic environment like lakes, rivers, ponds and streams. It serves different purposes, including food production, restoration of threatened and endangered species population, wild stock population enhancement the building of aquariums and fish culture and habitat restoration. Aquaculture is an organized production of a crop in the aquatic medium. The crop may be an animal or plant. Naturally, the organisms cultured to ordained as aquatic. Production of protein rich, nutritive, palatable, and easily digestible human food benefiting the whole society through plentiful food supplies at low or reasonable cost. Aquaculture has great role to play in the welfare of mankind. It is emerging as one of the most viable and promising enterprise for providing national and food security for human.

The Indian major carps *Catla catla, Labeo rohita and Cyprinus carpio* are the most important commercial fishes in India with a maximum market demand and acceptability as food by the consumers due to its taste. India about 67% of contributes total fresh water fish production. Fish is one of popular food widely consumed by world community. This is in separable from the content of fish that are rich in protein and omega 3 fatty acids. India is the home to more than 10% of global fish production. Fresh water aquaculture contributes to over 95% of the total aquaculture production. Presently, the country ranks second in the world in total fish production. With an annual fish production of about 9.06 million metric tones.

Aquaculture plays an important role in the generation of farmer's income. Asian countries have witnessed the growth of Aquaculture in recent. The ultimate goal is to produce the greatest possible weight/culture unit. Asia is the home for Aquaculture practice which dates back thousands of yrs. In the course of the nature of aquaculture has become more intricate, inter wening with other food sectors under the influence of political, social, Economic, technical and cultural factors with advancement of technology, the involvement of more aquatic species and farming practices has become possible and more choices can be offered to the consumers.

Asia and pacific represents the most important region for fisheries and aquaculture production. Fisheries in India are a very important economic activity and a flourishing sector with varied resources and potential. The important of inland fisheries sector highlighted in many reports and is significance in providing food security and generating local income frequently highlighted. Despite the significant contributions that fisheries and Aquaculture make to employment, nutrition and trade in developing world, they are rarely included in national development policy and donor priorities. Fish is the vital source of protein and micro nutrients and improve the Fish is also rich in iron, zinc, Magnesium, phosphorus, calcium, Vitamin A, C and marine fish is a good source for iodine. Quality of protein in largely vegetables and starch-based diets by providing essential amino acids. Fishes are an indispensable source of these nutrients for many people and small low value fish, which are largely consumed by the rural poor, providing more minerals that the same quality of meat or large fish, as they are consumed as a whole, with the bones intact. Fish also contain fatty acids, which are essential for the development of the brain and body and are particularly crucial for the diets of babies, children, pregnant and lactating women (FAO 2006). Normally fish contains 72% water, 19% protein, 8% fat, 0.5% calcium, 0.25% phosphorus and 0.1% vitamin A, B, C etc. Fish have calorific value. and low-fat content and high protein content. Further n-3 fatty acids found in fish prevent coronary heart diseases.

Biology of the fish

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Labeo rohita is considered as the fastest grower of the Indian major carps. It is easily distinguished by its relatively small or pointed head, almost terminal mouth with fringed lower lip, full reddish scales on the sides and pink fins. Body deep, dorsal profile more convex than abdominal. snout abuse and compressed, projecting beyond the jaws lips thick and fringed with distinct inner fold. Usually only one pair of small barbells. Sometimes a second, rostra pair. The dorsal fin originates between and midway snout and base of the caudal fin, lateralline scales 40-42. The dorsal fin has 12-13 branched rays. The colour of the body silvery on the sides and beneath. Usually, a red mark is present on the scales. The body showed more lines than that of Catla. Rohu are mostly column feeders. Major part of diet is decayed Macrophytes. A growth of 65 to 70cm were expected in the year first in a well-stocked pond. Sexual maturity is attained towards the end of second year. Rohu grows over to 1 metre in length in about 3 years attain maximum size.

Culture system of carps

Catla and Rohu are good species for culture in freshwater habitat as the organisms are easily acclimated in catchment and semi catchment areas such as ponds, tanks, lakes, streams, etc. They feed on phytoplanktons, zooplanktons and decayed organic matter.

Economic importance of fishes

Carps have high equality animal protein and nutritional value. Fish is rightly considered as the poor man's diet. It costs much less in comparison to its food value. It is almost a zero-carbohydrate food and is good for diabetes. Fish also contains poly unsaturated fatty acids, which are known to provide protection against cardio vascular diseases. This has got advantage over the other meat food. Fish protein comprises all the essential amino acids in desirable strength for human consumption namely Lysine Arginine, Histidine, Leucine, Isoleucine, Valine Threonine, Methinine, Phenyl Alanine and Tryptophan. [1] made survey on the feed management of major carps in India with special reference to Tamil Nadu. [2] studied the dietary requirement of Catla based on growth, protein deposition, lysine retention efficiency. [3] performed the biochemical components of conventional and nonconventional feed items used in poly culture pond. [4] studied the influence of supplementary feed on the growth and body mass in commercially important fish species. Hence an attempt has been made with the following objectives. To study the growth performance and biochemical composition of *Labeo rohita* using the feed type A, B and Con growth and biochemical components. To compare the enzyme profile of *Labeo rohita* using the different feed.

MATERIALS AND METHODS

Experimental animal and feed collection

The experimental animal *Labeo rohita* were collected from Kamashi fish farm, Kattur, Thanjavur, Tamil Nadu, India. The desirable size fishes were collected and acclimatized in the Laboratory. The feed A (Pelleted feed) B (Groundnut oil cake) were collected from the same fish farm and type C (Aquarium feed) purchased from the retail shop.

Experimental setup

Glass Aquarium tanks of 30 × 15 × 15cm were used for the present study. Experiment consists of control and one group experimental of 12 fishes. The control group received the normal diet and the experimental group received A, B and C feed. The experimental fishes were fed with experimental feed for 30 days. The glass tanks were aerated regularly and the water quality was maintained throughout the study period. The water quality parameters were maintained throughout the study period. The experimental animals were fed 40% at morning and 60% during evening. There was no mortality observed during the experimental period. The unfed was collected and dried and weighed.

Measurement of growth

Experimental fishes were weighted on the zero day and 30 days of the Experiment. The weight was taken using the electronic balance [5]. The length was measured using the centimeter scale. The growth performance of fish was evaluated in terms present weight gain (%), feed conversion Ratio (FCR) and specific Growth Rate (SGR)using the following formulae.

Weight Gain = Final weight – Initial weight

Specific Growth Rate (%) = Final weight – Initial weight / Total days of Experiments = %

Biochemical analysis

Estimation of protein content [6]

Tissue (50mg) was ground well with 80% ethanol and centrifuged 3000 rpm for 5minutes. The precipitate was dissolved in 1NNaOH solution. Biuret reagent 8mlwas added and mixed well and allowed to stand at room temperature for 30minutes and observed OD at 540nm. The protein content was calculated using the standard graph.

Estimation of carbohydrate [7]

Tissue(50mg) was taken in a test tube,1ml of phenol and 1ml of distilled water were added and followed by 5 ml of concentrated sulphuric acid was added and the test tube was kept in running tap water and cooled. Using blank the OD was measured at 490 nm. The carbohydrate content was estimated.

Estimation of lipids

The lipid content of the sample was estimated by [8]. The tissue was ground well and few drops of 0.005N Potassium chloride solution was added. This removes the non-lipid phase. The lipid phase was transferred to the micro beaker, warmed and dried for 2hrs at room temperature. The dried beaker was weighed and the lipid content was calculated.

Enzyme analysis

Alkaline phosphatase. The Alkaline phosphatase activity was estimated by Kind (1954). Buffered substrate(0.5ml) was added to the control, blank and test samples and 1.5 ml of distilled water was added mixed well and incubated for 3 minutes at 37°C. Chromogen reagent 1ml was added to all tubes and 0.5 ml of serum was added only to the test mix well and measure the OD at 510 nm.

Serum glutamate oxaloacetate transaminase (SGOT)

The SGOT was measured by using the method of [9]. Serum (0.1ml) was mixed with 0.5ml of substrate reagent and incubated at 60°C. Colouring reagent 0.5 ml was added and further incubated 20minutes at 37°C. After incubation 3mlof alkaline reagent added and colour intensity was read at 505 nm.

Serum glutamic pyruvate transaminase (SGPT)

The SGPT was estimated by using the method of [9]. Serum (0.1ml) was mixed with 0.5 ml colour reagent and

incubated at 37°C for 20 minutes. After incubation alkaline reagent was added and the colour intensity was measured at 505 nm.

RESULTS AND DISCUSSION

The present study growth performance of Indian major carp *Labeo rohita* using different feed revealed the following observation.

Growth

The control and diet A, B and C feed animal showed the 0-day length value of *Labeo rohita*, 15.4±1.0, 12.4±0.1, 11.7±1.0 and respectively. On the 30 days values was found 16±1.2, 13±0.1 and 32.2±0.12 respectively. The study revealed the type A feed showed significant variation between samples (Table 1).

Total protein

The total protein content of zero-day sample of control type A, B and C fed fishes exhibit the following observation. The total protein estimation study revealed that on the 0 day showed the value of 40.4±0.01, 40.14±0.02, 40.32±0.01, 42.31±0.05, and the 30thday revealed that the fish group fed with diet A revealed the protein content of 44.12±0.21,45.40±0.30 mg/g fed with diet B showed after 30 day of experiment 45.82±0.34 mg/g and c type diet fed fish revealed 49.14±0.56 mg%. The total protein estimation revealed that C type fed fishes showed the higher protein content (Table 2).

Table 1 Growth performance (weight and length) of *Labeo rohita* Fed with different diet

Experimental groups	Weight (gm)		Length (cm)	
	0 day	30 days	0 day	30 days
Control	38.5 ± 1.2	39.4 ± 0.1	10.76 ± 0.2	11.3 ± 0.1
A	39.9 ± 1.2	41.2 ± 1.5	15.4 ± 1.0	16 ± 1.2
B	24.4 ± 1.5	26.5 ± 1.3	12.4 ± 0.1	13 ± 0.1
C	37.5 ± 1.7	38.9 ± 1	11.7 ± 1.0	32.2 ± 0.12

Table 2 Total protein, carbohydrate and lipid content of *Labeo rohita* Fed with different diet

Experimental group	Protein(mg/g)		Carbohydrate(mg/g)		Lipid(mg/g)	
	0 day	30 days	0 day	30 days	0 day	30 days
Control	40.4 ± 0.01	44.12 ± 0.21	1.32 ± 0.01	1.32 ± 0.02	7.32 ± 0.01	7.42 ± 0.02
A	40.14 ± 0.02	45.40 ± 0.30	1.42 ± 0.1	1.68 ± 0.24	7.64 ± 0.1	7.70 ± 0.17
B	40.32 ± 0.01	45.82 ± 0.34	1.68 ± 0.02	1.70 ± 0.17	6.81 ± 0.01	7.10 ± 0.21
C	42.31 ± 0.05	49.14 ± 0.56	1.64 ± 0.03	1.69 ± 0.16	7.2 ± 0.01	7.90 ± 0.14

Total carbohydrate

The total carbohydrate content of zero-day sample of type A, B and C fed fishes showed the value.

The total carbohydrate content of the study revealed that the control 0 day showed 1.32±0.01 and type A fed fishes showed the values of 1.42±0.1, 1.68±0.02 and 1.64±0.03 mg/g. On the 30 day the control showed 1.32±0.01 and type A showed the value of 1.68±0.24 mg/g, the B type fed fishes showed 1.70±0.17 mg/g and the C type fed fishes showed 1.69±0.16 mg/g respectively. The study revealed among the three feeds tested the type B fed showed higher level (Table 3).

Total lipids

The Lipid content on the zero-day study revealed that control showed the value of 7.32±0.01mg/g and feed A showed the value of 7.64±0.1, feed B showed 6.81±0.01 and C feed showed 7.2±0.01 mg/g. On the 30 day of experiment revealed 7.42±0.02, 7.70±0.17, 7.10±0.21 and 7.90±0.14 mg/g respectively for the control and feed type A, B, C. The study revealed that the type B fed fishes showed less lipid content compared to other diet. Thus, the present study showed that among the three feed tested the type C feed showed higher protein content than that other feed.

Alkaline phosphate (ALP)

Alkaline phosphatase (ALP) of treatment II (62.05±3.20 IU/mg) muscle extract has maximum level of enzyme when compared to other treatment units (Table 3).

Glutamic oxaloacetic transaminase (GOT)

The treatment II in edible muscle extract glutamic oxaloacetic transaminase (GOT) were presented in (Table 3). The maximum level of GOT enzymes was presented in Treatment II (2.96±0.45 IU/mg) compare than treatments.

Table 3 Enzyme profile of *Labeo rohita* Fed with different diet

Experimental group	Alkaline phosphatase (U/mg)		Serum glutamic oxalo acetic transaminase (U/mg)		Serum glutamic pyruvate transaminase (U/mg)	
	0 day	30 days	0 day	30 days	0 day	30 days
control	47.58±0.11	47.62±0.02	2.02±0.02	2.12±0.02	0.181±0.07	0.19±0.01
A	45.4±0.002	45.72±0.01	1.56±0.22	1.65±0.1	0.193±0.002	1.07±0.001
B	55.60±1.8	56.21±0.22	1.62±0.21	1.68±0.11	0.25±0.22	0.29±0.01
C	62.05±3.11	62.72±0.022	2.96±0.32	2.99±0.002	0.263±0.33	0.27±0.01

Glutamic pyruvate transaminase (GPT)

Glutamic pyruvate transaminase (GPT) of treatment II (0.275±0.04 IU/mg) muscle extract have maximum level of enzyme were presented when compared to treatments (Table 3).

The results obtained on the growth parameters and somatic indices of the same species, four fingerlings after fed with formulated supplementary feed is presented in table. Growth of organism is a change in length or weight or both which proportionally increases with its age.

The growth generally increases in size of the organism which due to converts the chemical constituents of food matter into the building matter with in the body.

The result obtained during the present study on the growth parameters of four fish after feed with formulated supplementary feed shows that the weight and size of the fingerlings have increased with experimental feed, over control feed [4].

The data depicted in tables reveal that the *Labeo rohita* has gained weight (8.540±0.08gms) with the experimental feed. But with control feed it was only 7.280±0.007gms and this was a change of 17.35% over controls and the statistical analysis showed that it was also significant (P<0.0001).

Labeo showed an increase 6.040±0.052 cms in length with experimental fed the with control feed it was 4.100±0.01cms with a change of 47.31% over controls. Statistical analysis of the body weight and body length among the fish species with experimental feed it was observed that *Labeo rohita* has attained maximum weight and length in 30th days this may be attributed that the individual efficiency of converting food to their body mass.

In the present study all the food component in the feed have good amount of proteins. The proteins are major source which will directly convert into the body mass and in the present study the experimental food has good amounts of proteins. The Azolla consists of 26.62 crude proteins. This value of crude protein content in Azolla was similar to [10] this protein content was also higher than the values obtained by [10] and the proteins present in Benal gram was higher when compared to others [11] With the protein rich food all the fishes have attained maximum growth when compared to control feed. The ability of Azolla as a growth promoter is mainly due to its crude protein content because it contains almost all essential amino acids. The essential amino acids were markedly affects the nutritional status of the diet especially the protein and amino acids level [12].

Food in one of the important factors promoting growth and the feed conservation ratio (FCR) is an appropriate way to judge the acceptability and suitability of artificial feed for fish. Feed Conservation Ratio also termed as food quotient (or) food coefficient. The best FCR is obtained through the judicious use of feed and the production of natural food through fertilization. Among the three types of feed used in Tamil Nadu, the best FCR (1.1:1) was obtained by floating pellets.

Regulation of feed ration based on the actual feed consumption pattern helped farmers to minimize feed wastage. Furthermore, the higher stability of floating pellets ensured their nutritional quality without much loss due to leaching, even in cases where their consumption was delayed. The lowest FCR (1.96:1) was observed when conventional feeding practices were used, reflecting the higher wastage of feed as well as the low nutrient availability of the feed used.

Although carps are known to browse the feed through the holes in the feeding bas, there appears to be more feed wastage than in the case of conventional feeds. In contrast, the feeding of pellets provided a slightly better FCR (1.26:1). As the ponds are also fertilized, these FCR values reflect the combined effect of feed and the natural food produced through fertilization.

Although pellet feeds are gaining increasing acceptance, farmers hold a strong belief that the production and use of live food will help to improve the quality of fish and profitability. Farmers have started to adopt techniques to develop the periphytom community in the ponds, such as fixing bamboo poles, installing coconut leaves, hanging sugarcane basses as in the pond, etc.

These organic substrates are known to increase the availability of periphyton and other food organisms. The results of such research have demonstrated the great potential of this technique in increasing the production of carp, particularly of species like *Labeo rohita* [13-14]. Testing the commercial scale application and viability of these techniques may have great benefits for formers, as there is enormous demand for species like *rohu*. The addition of organic manures and inorganic fertilizers helps to improve natural food availability.

The quality of the natural food produced will also influence Feed conversion Ratios (FCR), as is evident from the small number of samples studies in Tamil Nadu comprising three different systems. The FCR of *Labeo rohita* during first month with experimental feed it was 1.688 ±0.06 and with control feed it was 1.754±0.008. The FCR is an indicator which is commonly used as a good indicator which indicates how efficient a feed or feeding strategy can be.

Specific Growth Rate (SGR) is the rate of growth per unit time and it was mainly based on final and initial weight and the time required for the growth. The SGR of *Labeo rohita* during the 30th day with experiment feed was 3.314±0.012 with control feed it was 3.400±0.084.

It reveals that in the case of *Labeo rohita* the Viscero Somatic Index with experimental feed. During the 30th day it was 3.840±0.042. It reveals that in the case of *Labeo rohita*. The Hepato Somatic Index during the 30th day with experimental feed it was 1.320±0.192 and with control feed it was 0.860±0.052. The Viscero Somatic Index and Hepato Somatic Index are important indicators of fish condition status. Measurement and analysis of these indices are very important in assessing food value.

The experimental feed is also having required amount of carbohydrate. [15] reported impact of formulated protein diet for the Growth of Indian Major Carps *Labeo rohita* revealed that the study could help the fish feed industrialists to prepare cheap and specific feed from the two locally available raw materials for better growth and survival rate [1]. Reported that the study on the feed management of major carps in India with special emphasize to Tamil Nadu revealed that there are various opportunities by which the profitability of the system can be further improved management strategies. Nandeesha *et al*. [1] also reported that the climate change is expected to threaten the sustained production of agricultural commodities that are the source for the major input in agriculture. Hence there is a need for the judicious allocation and the use of available feed resource by adopting efficient feed management.

In this maximum enzyme parameter content presented in the treatment –II compared than treatment –I and III. [16] reported that the study, no attempt was made to isolate phosvitin from the supernatant left after separation of lipovitellin (YP1 and YP2) from sodium chloride egg extract. The supernatant after separation of lipovitellin by ammonium sulphate precipitation has been shown to contain phosvitin as reported in other oviparous vertebrates including fish. Many investigators have isolated phosvitin like material with molecular weight ranging from 19- 43 KD a in a number of teleost fishes [17]. Work is in progress to isolate and characterize the phosvitin from carp ovaries.

CONCLUSION

The findings of a study on the growth pattern and enzyme status of *Labeo rohita*, specifically comparing a normal diet to three supplement diets labeled A, B, and C. The growth pattern and enzyme status of the *Labeo rohita* feed with normal diet and supplement diet (A, B, and C) revealed that the supplement diet fed *Labeo rohita* showed significant difference in growth pattern and enzyme status. Thus, the study concluded that the fish fed with supplement diet promotes growth in *Labeo rohita*.

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