Impact Of Chemicals Richmin and Vanimin on The Aspects of Body Length - Weight (Growth), Gonadal Somatic Index of The Fish Species *Catla catla, Labeo rohita* and *Cirrhinus mrigala*

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Abstract
Millions of human beings are suffering from hunger and malnutrition and fishes form a rich source of food and provide a window of opportunity to tide over the nutritional requirements of vast populace. The feeds are considered as the most need for farmers, therefore they should be effectively used. Lately, their use has been increased due to an effective balancing of meals and introduction of synthetic amino acids. Thus, this present study was aimed to study the efficacy of Richkin and Vanimin on the body length-weight and gonadal somatic index of the three fish species i.e.., *Catla catla, Labeo rohita* and *Cirrhinus mrigala.* Richmin than vanimin enhanced the body length, body weight and ovary weight of all the fish species and more increment of the three parameters were induced by Richmin fed fish species compared to vanimin fed ones. *Catla catla* showed greater increase of all the three parameters namely body length, body weight and ovary weight and was followed by *Cirrhinus mrigala* > *Labeo rohita.* Richmin than vanimin increased the gonadal somatic index of all three fishes selected for the study. Richmin was more effective in enhancing the gonadal somatic index of all fish species compared to the vanimin fed ones. The trend was more for *Labeo rohita* and was followed by *Catla catla* > *Cirrhinus mrigala.*
Keywords: Richmin, Vanimin, GSI, *Catla catla, Labeo rohita, Cirrhinus mrigala*

1. Introduction

Growth of organism means a change in length or weight or both with increasing age. Growth is generally an increase in size due to conversion of the food matter into the building matter in the body by the process of nutrition. The rate of growth varied to a large extent among fishes as these are cold blooded (Poikilotherms). It varies from species to species. It may vary for the same fish in different localities or for the same individual at different seasons (temperature etc). Also, different parts of the body or even different organs have different rates of growth. Except for the

males of piecilids (which have determinate growth) fishes continue to grow, practically through out their life (in determinate growth). However, in extreme old age their growth is extremely slow. Growth of fish is dependent on population density also. Higher densities tend to slow down growth, and low densities tend to hasten it (Srivastava, 1999).

Food is one of the important factors promoting growth and enriching the biochemical composition of fishes. Growth attained by fish is naturally derived from the food consumed. The seansonal and diurnal abundance of different food organisms may influence the movements and migrations of fishes. Hence it is essential to have an understanding of the relation between the fishes and food organisms for prediction and exploitation of fish populations. The importance of knowledge of food and feeding habits of fish in understanding its biology has been well established. It helps in finding the distribution of a fish population which is highly essential for successful management of any fishery (Rao and Durga Prasad, 2002). Herbivorous fishes have low assimilation efficiency and high net growth efficiency. Gross growth efficiency is higher in carnivores when compared to herbivores. This is due to the low assimilation efficiency of the herbivores. (Patterson Edward et al., 1996).

Study on the natural growth of fishes is a basic necessity for assessing the cultural possibilities of the fishes. Under natural conditions, the growth of a fish is in part dependent on the population density (Lecren. 1965). Generally a direct relationship exists between food abundance and growth rate. Although the fish were able to utilize the various dietary carbohydrates, the efficiency of their utilization was significantly affected with the nature / complexity of carbohydrate fed. Maximum growth and best conversion efficiencies and increased nutrient - retention occurred in fish fed the sucrose diet (Erfanullah, 1995). Higher stocking density may cause crowding effects and reduction of growth rate. In many fishes, fish culture practices, where the fishes are confined in a restricted space, size - dominance in feeding, is often of considerable significance (Yamamoto 2005). Growth in fishes has been found to be affected by a variety of factors such as water, temperature, levels of dissolved oxygen and ammonia, salinity and photo period. Such factors interact with each other to influence growth rates. Growth in fishes is also dependent on other factors such as the degree of competition. The amount and quality of food ingested and the age and state of maturity of the fish (Mahaboob, 2002).

Weight of fish is a function of its length. Conditions of fish is expressed by the ratio of length to the weight of the fish at any given moment. The fish is set to have a better health condition when this ratio is high. Mathematically the condition of fish is expressed by the Fultons formula as follows (Sreevasthava, 1999). Providing the fish with a nutritional diet indicates better nutritional efficiency of diet and implies that the specimens tend to put more weight and body length. In this study length weight relationships were used to evaluate the effects of artificial diets on the relative heaviness and health condition of the fishes (Najib-ur-Rahaman, 1986). But studies involving the growth patterns of fishes fed with better synthetic feed are far and few. Therefore an attempt is made in this investigation to study the growth in terms of body length and weight in synthetic feeds like richmin and vanimin.

2. Material & Methods

2.1 Synthetic Feed Additives:

For the present study stocking / Breeders pond. Breeding tubs. Hatching tub and Nursery cum Rearing ponds were used at the Government fish farm at Warangal (District) Telangana, India. The breeders were fed with shell, rice bran and ground nut oil cake regularly at the rate of 2% body weight of the fish. The fishes selected for the study shall be divided into two groups viz. control group and experimental groups .The control group of fishes shall be fed with control feed i.e. Groundnut cake, rice bran. The experimental group of fishes shall further be divided into two groups. Richmin and Vanimin which are commercially available are been selected for the study. The first group of experimental fish shall be fed with control feed mixed with Richmin. The second group of experimental fish shall be fed with control feed mixed with vanimin. The two groups of experimental fish shall be fed twice a day at 10 a.m. and at 5 p.m. The exposure period selected for the study is 30 days.after 30 days the fishes were killed and isolated the tissues like muscle and liver at 40C and stored at - 800C and assay the activity biochemical and physiological parameters such as Asperate amino transferase (AAT), Alanine Amino Transferase (ALAT) and Glutamate dehydrogenase (GDH).

2.2 Additives of synthetic feed:

Richmin and Vanimin which are commercially available have been selected for the study. All other chemicals used are of technical grade from PVS laboratories, Vijayawada, Andhra Pradesh (India).

2.3 Method of Application:

The below table shows the rate at which richmin is to be dissolved as recommended by the Arias Agro Vet Industries Pvt. Ltd., (Table-1).

2.3 General Experimental Conditions:

For the present study, the following experimental ponds and tubs were used at the Government fish farm, at Warangal, District (Telangana). The breeders were fed with shellar rice bran and ground nut oil cake regularly at the rate of 2% body weight of the fish.

2.4 Pond types:

Stocking / Breeders pond: There are two breeders' ponds; these are called as segregation ponds for maintaining and rearing of breeding species. The shape of the pond is rectangle of size 100'x30'x4'. Each pond is provided with inlet, outlet and overflow pipe. The bottom of pond is katcha to enable the breeders, to grow well and for buffer action. Every week the stagnant water is replaced with fresh water through exchange method.

Breeding tubs: 4 cement breeding tubs of size 15'x10'x4' were used for breeding of major carps. Each pond is provided with an inlet of 2" GI pipe and 2" outlet is provided at the bottom for bailing out water. Prior to, the water is released into the pond upto the over flow pipe, care is taken to maintain the water level with continuous water flow.

Table-1. Method of Application

Ponds	Area (Decimal)	Av. Depth	Dose	Method Of Application
Nursery Rearing Stock in	4.56 33.00 100.00 (1 acre) 247.59 (1 ha)	4 5 5 5	6 gms 66.5 gm 167 gms 500 gms	Dissolve RICHMIN well in water and apply at different corners of the pond preferably at morning hours before mating.

Hatching tub: The hatching tub is echo-hatchery type and movable. The tub is made up of zinc sheet and is cylindrical in shape. The tub height is 2.10' and dia of 3.2'. There are two chambers inside the tub since there is a round mesh of 1.80' height and 30 cm dia. There is one outlet in this tub to drain out the spawn after hatching. There is one semicircular chamber ½" pipe with nozzle to circulate water flow and to wash the eggs with freshwater continuously. The nylon cloth is inserted over the second chamber to arrest the over flow of eggs into the second chamber.

Nursery cum rearing pond: These ponds are built with brick and cement and the shape of nursery pond is rectangle, having the size of 50'x15'x4'. Each nursery is provided with an inlet, outlet and overflow pipe. The bottom and side walls of the nursery are plastered with cement to make them smooth. The inlet is connected to the pipeline to draw water. The inlet is provided with 3 inch gate valve to regulate the flow of water.

2.5 Determination of Body Length and Weight

Natural growth in terms of length and weight in different synthetic feeds like Agrimin and Fishmin is measured separately. Growth in terms of length and weight was recorded and calculated by using the following formula:

1. Total length gain TLG (%) =
   $L - L_0 / L_0 \times 100$
   Where L0 = Initial Length of Fish
   L = Final Length of Fish

2. Wet Weight gain WWG (%) =

$w - w_0 / w_0 \times 100$

Where w_0 = Initial Wet Weight of Fish

W = Final Wet Weight of Fish

2.6 Validity of experimental procedures:

General: For all the enzymes studied in the current investigation, the assays were standardised by conducting preliminary tests to determine the optimal pH, temperature, enzyme, and substrate concentration and optional conditions were subsequently followed for each enzyme assay.

Aliquots for assay: Aliquots were selected such that initial rates were approximated as nearly as possible yet providing sufficient product to fall in a convenient range for spectrophotometric measurements.

Enzyme activities were expressed in standard i.e., µ moles of product formed or substrate cleaned /mg protein /hr. All the enzymes were made under the conditions following zero order kinetics. All the products of the enzymatic reactions were measured by colorimetric procedures in which the optical density (absorbance) of the resulting coloured ample was proportional to the concentration of the reaction products.

2.7 Statistical Analysis:

For each parameter, the mean of individual observations (for both control and experimental groups) were taken into consideration. Statistical significance of the data was analysed through two way ANOVA (Analysis of variance); SNK (Student Newman-Keuls) test and regression analysis (Zeitler, 1984).

3. Results and Discussion

Indian Major Carps is considered as fast growing fish. Its highest growth performance after 3 months is between 10-13.75 cm (Giri, 1999). Length and Weight are attributes of growth that can be easily measured. In the present study growth and weight have been studied in different synthetic feeds, richmin and vanimin. This major carp *C. catla* recorded higher rate of growth in terms of length and weight with richmin and vanimin followed by *C.mrigala* and *L.rohita* (Table -2). The same effect is observed in Ovary weight and Gonadal Somatic Index (Figure-1).

In Synthetic feed fish species not only gain growth in terms of length but also in weight. These findings on growth are supported by the earlier studies where Mitra, 1942 observed higher rate of growth in Rohu in highly nutritive ponds in Orissa. Godratizades et al, (2011) stated that under normal growth conditions Rohu will attain a length of 38-48 cm and a weight of 680 gms in first year. According to Brown (2004) in well stocked ponds Rohu may attain 34-40 cm body length in a period of one year. Goede et al (1990) observed that Rohu attained 35-45 cm body length with the weight of 670-900 gm in one year. The findings of Church et al., (1966) who reported that extrusion improved significantly all apparent digestibility coefficients (ADC), also, Dipesh Debnath et al., (2005) who reported that pellets containing good source of protein increased consumption and reduced waste from handling.Concerning total fish production per feddan the average weights of fish thousand stocking density which fed extruded and non-extruded diet.

According to application of (Diwan, 2003) the study concludes that, 6% nutriwin and 3% frankmin synthetic additives elicited better performance in feed intake, growth, FCR and leucocyte counts compared to other treatments and hence, these levels can be considered as optimum dietary dose for carp. Among the two feed additives tested, frankmin appears to be more ec onomical than nutriwin as it is required in less quantity (3%).According to (Bashamohideen, 1984) she investigated that formulation of quality fish feeds from indigenous raw materials and their effects on growth and maturity of Mystus gulio.Taking the above findings into consideration, it may be concluded that the fast growing fish species not only obtained higher growth rate in normal waters but their growth rate further increased when they were fed with synthetic feeds.

Table-2. Effect of Richmin and Vanimin on Body Length and Body Weight in various fish species (Values expressed as mm for length and gm for weight.)

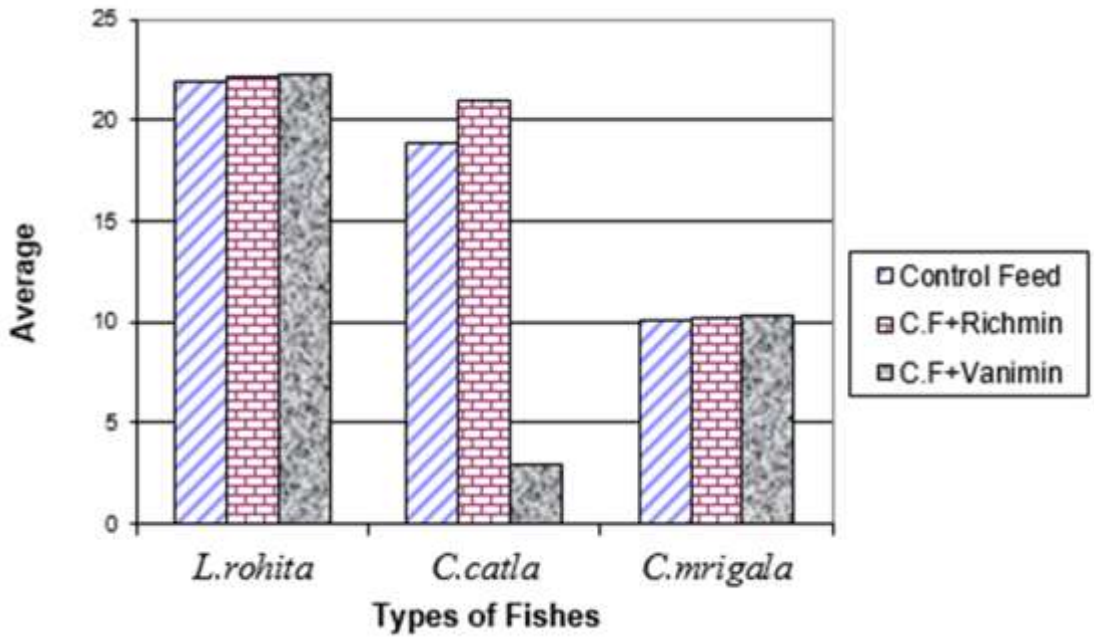
Name of the Feed	Name of the parameter					
	Body Length			Body Weight		
	Labeo rohita	*Catla catla*	*Cirrhinus mrigala*	*Labeo rohita*	*Catla catla*	*Cirrhinus mrigala*
Control Feed AV SD PC t	543.9 ±1.09	496 ±2.42	670 ±7.14	2393 ±3.17	10875 ±17.16	2902 ±3.16
Control Feed + Richmin AV SD PC t	585 ±4.18 7.52 *	790 ±2.36 59.27 *	795 ±1.46 18.65 *	2703 ±2.22 12.95 *	14373 ±4.06 32.16 *	3145 ±3.86 8.37 *
Control feed + Vanimin AV SD PC t	573 ±0.99 5.35 *	690 ±1.29 39.11 *	690 ±1.29 2.9 *	2443 ±14.19 2.08 *	12470 ±15.66 14.66 *	3070 ±2.24 5.78 *

Each value is the mean ± SD of 7 samples
*AV – Average, SD – Standard Deviation, PC – Percentage change over the control; * P<0.001, N.S.- Not significant*

The effects of essential amino acids supplementation for animal growth performance were markedly affected by the nutritional status of the diet, especially the protein and aminoacid based

levels as noted by (Yamamoto et al., 2005). The supplementation of essential amino acids composition achieved significantly better growth and feed utilization compared with the reference diets without supplemented essential amino acids when the dietary protein levels were much lower than their requirements. However, in fish diets, the supplementation of amino acid s and lysine in diet is seldom reported by investigators. In channel. *catfish* (Rao et al, 2002) and rainbow trout (Yamamoto et al., 2005), researchers showed the supplementation of insufficient protein diet improved the feed efficiency but did not enhance fish growth. In Asian sea bass, (Lecren, 1965) demonstrated the crystalline essential aminoacids and supplementation to an amino acids component deficient diet increased fish growth and the response was more pronounced for the low protein diet. The protein and aminoacids requirements of juvenile grass carp have been established in our laboratory by (Zeitler et al, 1984) with optimal protein, lysine and methionine levels to be 391.4, 54.4 and 29.7 g kg-1 (on the basis of dietary protein), respectively. In the present experiment, the crude protein level of the reference.

Figure-1. Impact of Richmin and Vanimin on the *Gonadal Somatic Index* of Selected Fish species *C.catla, L.rohita, C.mrigala.*



Srivastava (1999) reported that the reproductive functions are affected by GSI value of feed and hence higher GSI value proves that better impact on gonads and the better choice of the feed among the fishes from beginning of feed administration. It has been calculated that moisture content was lower in than the others from the beginning of administration of the various test feeds and it also says that feed enhancing improves the flesh content of the test fish

The present investigation has revealed a significant raise in the growth rates of all selected fish species. Further similar patterns in growth with better food conditions in fishes (Rao and Durga

Prasad 2002) are in precise agreement with the findings of the present study. The growth efficiency of the richmin and vanimin fed fishes has substantially increased. This may be explained as suggested by other investigators (Bilinski, 1969) also. Dietary minerals influence the growth and survival of many fish species. Since the materials absorbed from water do not always meet the total metabolic requirements of fish, their supplementation through diets results in growth promotion. Krishna Murthy (1998) have made study from the effect of various feeds on the hatching of *Cyprinus carpio* in aquarium with reference to temperature. Under laboratory condition a feeding experiment of *Cyprinus carpio* (Linn.) hatching was carried out in glass aquarium for a period of 30 days. They studied on the growth and survival rate of the experimental hatching were studied on seven different feeds of both artificial and natural origin. Growth rate and survival rate showed different pattern depending on the nature of ingredients of the formulated feeds. Bashamohideen (1984) made observations on the fecundity and sex ratio of the Climbing perch; they found fecundity of A. testudineus to vary from 3739 to 72562.
The number of egg was found to increase linearly with the increase of body length, ovary length, body weight, ovary weight and the standard length of the bodywhen fed with different feeds of both artificial and natural origin. It not only satisfies the needs of body for growth but also osmoregulation in fresh water fish. Hence provision of adequate amount of salt through synthetic feed would spare energy used in osmoregulation and reduce stress, thereby leaving more energy for growth as observed in richmin and vanimin in the present study. Moreover the more accumulation of carbohydrates in the form of glucose and glycogen, protein and fat contents maintain of high energy charge. As shown in the previous chapters an increase in the rate of metabolism results in an increase in growth performance. Further, it may concluded that selected fish species fed with synthetic feed supplemented by many of nutrients and minerals, resulted in significant increase in length and weight and ultimately reflected in the profound growth rate.

4. Conclusion

The study revealed that synthetic feed Additives have accelerative upon the metabolism of fish species. Thus, Richmin and Vanimin additives have enormous nutritional components which enhance the biomass of the fishes and this result shows in improving the yield and productivity of fresh water carps. Overall in my study I feel that feed additives appeared to be more beneficial in improving the metabolism and fish yield to farmers. From the present experimental work, the author concludes that both Richmin and Vanimin increase the productivity over the control hence they may be used in Aquaculture practices.

Reference

1. Bashamohideen, Md. 1984. Physiological mechanisms and behavioural patterns during environmental – stress and environmental – adaptation (review article) Bull.Ethol.Soc.Ind. 147-152.

2. Bilinski, E. 1969. Lipid catabolism in fish muscle. In: Fish in research (Neuhaus, O.W. and Halver, J.E. Eds.), Academic press, New York, London. 135-151.
3. Brown ML, Murphy BR (2004) Seasonal dynamics of direct and indirect condition indicies in relation to energy allocation in largemouth bass Micropterus salmoides. Ecol Fresh Fish 13:23– 36
4. Church, R.B. and Robertson, F.W. (1966). A biochemical studies on the growth of Drosophilla melanogaster. J. Exp. Zool. 162 : 337-352.
5. Dipesh Debnath, N.P. Sahu, AK. Pal, Kartik Baruah, Sona Yengkokpam and S.C. Mukherjee 2005. Present Scenario and Future Prospects of Phytase in Aquafeed. Review – Asian Australasian Journal of Animal Sciences.
6. Diwan, A.D. 2003. Fish for nutritional and food security, Souvenir, in National Conference on "Urban lakes environmental status, Economics and management options" conducted at VV college, Hyd, Andhra Pradesh. April 5^{th}-6^{th}, 2003. 65-76.
7. Erfanullah, A.K.J. 1995. Growth response of fingerling Indian major carp, *Labeo rohita* (Ham.) to various sources of dietary carbohydrate. *J. Aquaculture*, in the *tropics*. 10(4):287-296.
8. Giri, S.S., 1999. Role of nutrition feeding strategies for sustainable aquaculture. National workshop on sustainable aquaculture, PAU, Ludhiana, 21-22 January 1999
9. Godratizades, S., Sahar, G., Farhoudi, M and Habibian, R. 2011**.** Effects of addition of *saccharomyces cervisae and Bacillus subtitis* in diet on selected Haemotological and Biochemica; parameters in Common carp (*Cyprinus carpio*). *World Jour. Of Fish and Marine Sciences* **3**(1): 96-99.
10. Goede RW, Narton BA (1990) Organismic indices and an autopsybased assessment as indicators of health and condition of fish. In: Adams SA (ed) Biological indicators of stress. American Fisheries Society, Bethesda, pp 93–108
11. Krishna Murthy, C.R. 1981. Biological effects of environmental pollution. Paper presented in 50^{th} Ann. Gen. Body meeting of the Soci. of. Biol.Chemists. Symposium Pool. Published in Indian.J. Biophys. Biochem. 8:245. Abstract No.:7.
12. Lecren, E.D. 1965. Some factors regulating the size of populations of fresh water fish. *Milt. Int. Verin. Theor. Angew. Limnol*. 13:88-105.
13. Mahaboob S, Sheri AN., 2002. Relationships among gonad weight, liver weight and body weight of major, common and some Chinese under composite culture systems with special reference to pond fertilization. Asian-Australasian Journal of Animal Sciences 15(5): 740-744.
14. Najib-ur-rahman, 1986. Feeding, body composition and production of teleosts in controlled aquatic systems and biological value of fish protein, Ph.D.Thesis, submitted to Aligarh Muslim University. 79-80.
15. Patterson Edward, J.K., Raghunathan, C., Rajamanickam, S. and Ayyakkannu, 1996. An artificial prawn feed formation with non edible meat of gastropods, *Chicoreus virgineus* and *Rapana rapiformis*. Indian.J.Mar.Sci. 25:248-252.

16. Rao, L.M. and Durga prasad, N.H.K. 2002. Comparative studies on the food and feeding habits of *Therapon jarbua* (Forskal) in relation to aquatic pollution, Indian. J. Fish. 49(2): 199-203.
17. Srivastava, C.B.L. 1999. Induced breeding of fish in India, growth and age studies. In: A textbook of fishery science and Indian fisheries. PP:68-69,207,225.
18. Yamamoto, T., T, Sugita and H, Furuita, 2005. Essential amino acid supplementation to fish mealbased diets with low protein to energy ratios improves the protein utilization in juvenile rainbow trout *Oncorhynchus mykiss*. *Journal of Aquaculture*, 246: 379-391.
19. Zeitler, M.H., Kirchgessner, M. and Schwarz, F.J. 1984. Effects of different protein and energy supplies on carcass composition of carp, *Cyprinus carpio.* Aquaculture. 36:37-48