Effect of Plant and Animal Dietary Lipid Levels on The Feed Utilization, Growth Performance, Body Composition and Serum Metabolites of *Cirrhinus Mrigala*

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ABSTRACT

Aquaculture is the rapid food production sector in the world and contributing more than fifty percent fish food consumption in Asia. Fish (*Cirrhinus Mrigala)* major source of polyunsaturated fatty acids especially omega-3 and omega-6. The present study was conducted to evaluate the effect of plant and animal dietary lipid levels on the feed utilization, growth performance, body composition and serum metabolites of *Cirrhinus mrigala*. Four experimental diets were formulated with different levels of lipids viz. 0%, 3%, 6% and 9%.12 fingerlings were stocked in experimental tanks and fish was fed once a day. Water quality parameters (Temperature, pH and DO) were monitored throughout the whole research trial period. Highest value of increase in weight (g) gain was noted in T2 17.21(g) as compared to T1 that is 12.31(g), T3 9.89(g) and T0 8.91(g). Greatest values of FCR were found in T3 (2.17) as compared to T1 (2.13), T0 (2.09) and T2 (1.12). Greatest value of SGR was found in treatment 2. Gain in fork length was observed in different treatments. The best length gain was observed in T2 (2.74) as compared to T1 (1.91), T3 (1.73) and T0 (1.62). Greatest value of gain in total length was observed in treatment T3 (2.73). The maximum values of protein contents of *C. mrigala* were recorded under the diet T2 as (15.21%). The maximum value of Ash was observed in T2 (8.41) and minimum values of ash was observed in T3 (7.51). The minimum value of moisture (71.34%) was recorded under the diet T1 while the maximum value (73.63%) was observed under the diet T3. Maximum numbers of blood protein were found in T2 (2.83 mg/dl). Maximum number of blood cholesterol was observed in T1 (203.5 mg/dl). The maximum number of Triglycerides was observed in treatment 3 (223.04 mg/dl) and higher numbers of blood glucose were observed in treatment 2 (27.71 mg/dl). Statistical data was analyzed by comparison of ANOVA (analysis of variance).

Keywords: Blood protein, Fish Feed, Plant Fats, Animal Lipids, Length, Protein.

INTRODUCTION

Aquaculture field is considered to be the developing field to meet human protein requirements in some parts of the world. Fish also provide macronutrients such as carbohydrates, proteins, lipids and other minerals such as calcium, magnesium, iron and phosphorus. The total estimated fish production of the world in 2012 was 158 million metric tons with annual consumption of around 19.2 kg per person (Abbas, F., N. A. Qureshi, N. Khan, M. Ashraf and K. J. Iqbal. 2019). *Cirrhinus mrigala* is major source of polyunsaturated fatty acids especially omega-3 and omega-6 fatty acid. Lipids are a category of organic natural compounds consisting of fats, oils, phospholipids and sterols As an essential nutrient, lipids are assimilated by fish for tissue remodeling and new tissue growth (Jabeen, S., M. Salim, and P. Akhtar. 2004). Dietary Lipid have a significant role to play in providing a good source of concentrated energy, essential fatty acids and fat-soluble vitamins, such as fish have a limited capacity to use carbohydrates as an energy source. *Cirrhinus mrigala* is bottom feeder fish

species, feed on decaying natural material and vegetable debris (Khan, Mukhtar A., I. Ahmed, and S. F. Abidi. 2004).

Objectives

- To investigate the effect of plant and animal dietary lipid levels on the feed utilization, growth performance, body composition and serum metabolites of *Cirrhinus mrigala*.
- To study the effect of dietary lipids in *Cirrhinus mrigala* with different mixtures of both plant and animal diet components.

METHODOLOGY

The trial was performed at Fish Research Farms, Department of Zoology, Wilde life and Fisheries, University of Agriculture, Faisalabad. *Cirrhinus mrigala* fingerlings were purchased from Fish Seed Hatchery, Satiana road Faisalabad. Fingerlings of *Cirrhinus mrigala* were put in tanks where they were acclimatized to new experimental conditions. 12 fingerlings were stocked in experimental tanks and fish fed once a day. Experimental diets was made by supplementing different plants and animal lipid ingredients such as Poultry lipids, fish oil, Canola oil, Soya bean oil, fish meal , rice bran, wheat flour, ascorbic acid (antioxidant) and vitamin minerals complex. Four experimental diets were prepared with different levels of dietary lipids viz. 0%, 3%, 6% and 9% respectively.

Test Diet Table

Four experimental diets was made by supplementing different plant and animal lipid levels viz. 0%, 3%, 6% and 9%.

Animal Based lipids	0%Fish oil + Poultry lipids	3%Fish oil + Poultry lipids	6%Fish oil + Poultry lipids	9%Fish oil + Poultry lipids
Plant Based Fat	0%Canola oil+ Soya bean oil	3%Canola oil+ Soya bean oil	6%Canola oil+ Soya bean oil	9%Canola oil+ Soya bean oil
Fish meal	27.0g	26.0g	23.0g	22.0g
Rice bran	30.0g	28.0g	28.0g	28.0g
Wheat Flour	40.0g	40.0g	40.0g	40.0g
Ascorbic-acid (antioxidant)	1.0g	1.0g	1.0g	1.0g
Vitamin Mineral complex	2.0g	2.0g	2.0g	2.0g
Total	100	100	100	100

10-15% water added to prepare suitable dough and processed by pelleting machine to make feed pellets. Before undertaking trial, by the use of virtual meter dissolved oxygen of water medium was checked and maintained (HANNA, version HI 9147). Water quality parameter i.e. Temperature of water and pH were monitored by way of AMPROBE pH meter. Aeration was given to experimental tanks through the usage of aeration capillary system. Four treatments of fish were reared in aquariums for 120 days. Feed intake was recorded throughout experimental trials. The fingerling was fed according to 2% of their wet body weight. Growth performance was determined by having weekly weights of fishes from each treatment. Feed utilization was determined by collecting uneaten feed from the tanks of the fishes. Growth performance and feed utilization was determined in terms of absolute weight (WG) gain (%), specific growth rate (SGR), survival rate (%) and feed conversion ratio (FCR), Variations found after every week. Feed percentage was adjusted after every week, according to increase in body weight of fingerlings. The feeding session were lasted for 3-3.5 hours. After that un-consumed

diets were collected from the tanks and tanks were washed and re-filled with fresh water. That un-consumed diet was dried in oven and was used in FCR determination. Proximate body composition is a study of raw proteins, lipids, moisture and ash content of fish. The lower proportion of water, higher lipids content and higher energy density in the fish. Crude protein (CP) was determined by micro Kjeldahl method. Crude fat (CF) Petroleum ether extraction method (Soxhlet method) was used for determination of crude fat (CF). Moisture content analyzed by drying it in oven at 105 centigrade and Crude Ash sample was ignited in the muffle furnace for the determination of ash content. Water quality parameters (Temperature, pH and DO) were monitored throughout the whole trial period.

CONCLUSION/RESULTS

Highest value of increase in weight (g) gain was noted in T2 17.21(g) as compared to T1 that is 12.31(g), T3 9.89(g) and T0 8.91(g). Greatest values of FCR were found in T3 (2.17) as compared to T1 (2.13), T0 (2.09) and T2 (1.12). Greatest value of SGR was found in treatment 2. Gain in fork length was observed in different treatments. The best length gain was observed in T2 (2.74) as compared to T1 (1.91), T3 (1.73) and T0 (1.62). Greatest value of gain in total length was observed in treatment T3 (2.73).The maximum values of protein contents of C. mrigala were recorded under the diet T2 as (15.21%). The maximum value of Ash was observed in T2 (8.41) and minimum values of ash was observed in T3 (7.51). The minimum value of moisture (71.34%) was recorded under the diet T1 while the maximum value (73.63%) was observed under the diet T3.Maximum numbers of blood protein were found in T2 (2.83 mg/dl). Maximum number of blood cholesterol was observed in T1 (203.5 mg/dl). The maximum number of Triglycerides was observed in treatment 3 (223.04 mg/dl) and higher numbers of blood glucose were observed in treatment 2 (27.71 mg/dl). The statistical data was analyzed by comparison of ANOVA (analysis of variance).The value of the specific growth rate was calculated at the termination of the experimental trials and the highest value for the SGR was found to be the diet 6%, followed by diet 9% and least with diet 3%. While working on the fingerlings of *Cirrhinus mrigala*, recorded the best SGR in the group of fishes fed with 6 to 9% dietary lipid as compare to 3%. The results of present study showed that specific levels of animal dietary feed products enhance the 75% growth and development of fish (*Cirrhinus mrigala)* but when the amount of these dietary contents increased than the specific levels, some negative changes was observed. In the present study when dietary lipids increased more than 75% then reduced growth was observed. The lower proportion of water, higher lipids content and higher energy density in the fish. Increased amount of food in tanks create suffocation and caused the death of fish.

Serum Metabolites	Control Treatment	Treatment 1	Treatment 2	Treatment 3
Blood Protein (mg/dl)	1.95 mg/dl	2.43 mg/dl	2.83 mg/dl	2.23 mg/dl
Blood Glucose (mg/dl)	21.63mg/dl	23.85 mg/dl	27.71 mg/dl	22.56 mg/dl
Cholesterol (mg/dl)	189.05mg/dl	203.5mg/dl	202.2mg/dl	197.21mg/dl
Triglycerides (mg/dl)	207.01 mg/dl	212.03 mg/dl	209.03mg/dl	223.04 mg/dl

Showing blood protein, glucose, cholesterol and triglyceride in *Cirrhinus mrigala* collected from aquatic tanks

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