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Research Article

COMPARATIVE STUDIES ON LIPID OF FRESH WATER AND TREATED SEWAGE WATER PONDS CULTURE CARP FISH *LABEO ROHITA* IN TIRUCHIRAPPALLI DISTRICT

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ABSTRACT

The biochemical characteristics (lipid in muscle, intestine and gills) of the freshwater carp fish *Labeo rohita* were estimated. The lipid content maximum was recorded in muscle tissue of *L. rohita* at treated sewage fish culture pond (station – II) and minimum, the protein content was observed in gill tissue of *L. rohita* at fresh water fish culture pond (station – I). The total lipid content was studied in different days of 7, 14, 12 and 28 days. The different tissues of muscle, intestine and gill lipid maximum was found to be sewage treated fish and compared than fresh water fish *L. rohita*. This study recommended that the wastewater should be treated before discharge into this culture pond.

Keywords: Sewage treated, fish culture pond, Organs, Lipid, *Labeo rohita.*

INTRODUCTION

Fish has long been recognized as valuable resource of high quality food in human diet. Aquaculture is a low energy expenditure and protein yielding in comparison to other agriculture sectors. Since aquaculture production is affected by multiple factors, many characteristics must be measured and analyzed for production. The physical and chemical characteristic of water bodies, seed quality, stocking density, season, cultural system, feeding and harvesting patterns are important factors. The growth rate of aquaculture species depends on their genetic potential as well as several other factors that influence the growth of fish genetic makeup, behavior, population dynamics and endocrinology (Sahu *et al.*, 2000).

Fish has attained great nutritional significance in recent years for providing best source of protein and oil. It has been estimated that farmed *Labeo rohita* is found to be best due to its nutritional as well as commercial value as compared to that of wild fish. Fish lipid has also been assured great nutritional significance owing to their protective role against the developing cardiovascular diseases. Coronary heart diseases have been identified as one of the major source of death in Pakistan, with mortality rate increasing every year (Mahboob *et al.*, 2004). As fish is rich in providing unsaturated fatty acids, so there is no risk of cardiovascular disease and any other blockage in the vessels and also they (lipids) provide energy 9.3 Cal/g twice than that of protein (Anonymous, 1977).

Choi and Regenstein, (2000) suggested that in addition to producing fish gelatin to meet religious needs, the commercial use of skin and bones which are normally discarded is good waste management and as well as economic benefit. Fish skin and scales that are discarded as dressing losses are an important source of protein, lipids and minerals (Iqbal, 2002).

Composition of the body is a good indicator for the physiological condition of a fish but it is relatively time consuming process. Proximate body composition is the analysis of carbohydrates, proteins and moisture contents of fish. The percentage of water is good indicator of its relative contents of energy, proteins and lipids. The lower percentage of water, greater lipids, protein contents and higher energy density present in the fish (Dempson *et al*., 2004).

In recent years, the need for renewable energy generation and the need to divert biodegradable waste from landfill have pushed anaerobic digestion into the market for the treatment of biodegradable municipal waste. Out of the biodegradable fraction of municipal waste, food waste is

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the most challenging because of its high moisture content and readily biodegradable nature (Davidsson *et al*., 2008; Stroot *et al*., 2001). Although many options have been suggested for the management of food waste, including incineration, composting, the use of food waste disposal units (FWDs) and anaerobic digestion has attracted more interest, particularly in policy making, due to its potential for energy generation (Banks *et al*., 2008; Gallert *et al*., 2003; Iacovidou *et al*., 2012b; Zhang *et al*., 2005, 2007). In the present observation, the waste water was used in the fish food production.

MATERIALS AND METHODS

Fresh water fish *L. rohita* were collected from culture pond and treated waste water ponds in Tiruchirappalli area and experiment was conducted in the laboratory at Department of Zoology, Government Arts College, Ariyalur. The fishes were sacrificed and tissues such as muscles, intestine and gill were dissected and removed. The tissues (10 mg) were homogenized in 80% methanol, centrifuged at 3500 rpm for 15 min. and the clear supernatant was used for the analysis of total Lipids. Total lipid in the tissue was estimated by the method Folch *et al.* (1957).

RESULTS

In the present investigation, the total lipid content was analyzed from freshwater carp *L. rohita*. The lipid values were noted in 7, 14, 21 and 28 days. The total lipid content was measured from different tissues (muscle, intestine and gills) of carp *L. rohita*. The maximum amount of lipid (0.70 mg/g) was recorded in muscle tissue for a period of 28 days and minimum lipid content (0.04 mg/g) was recorded in gill tissue of *L. rohita* for a period of 7 days.

Station – I (Freshwater culture carp fish *L. rohita*)

Lipid values were measured from freshwater carp fish *L. rohita* in different tissues (muscle, intestine and gills), during the period of 7, 14, 21 and 28 days.

In the present study the lipid level 0.23 ± 0.07, 0.38 ± 0.13, 0.39 ± 0.06 and 0.28 ± 0.03 mg/g were recorded in muscle tissues (Figure 1), the intestinal lipid values 0.15 ± 0.04, 0.24 ± 0.06, 0.27 ± 0.07 and 0.24 ± 0.03 mg/g were recorded in carp *L. rohita* (Figure 2) and the gill lipid level 0.04 ± 0.02, 0.09 ± 0.03, 0.06 ± 0.03, 0.06 ± 0.02 were recorded in *L. rohita* during the period of 7, 14, 21 and 28 days (Figure 3). The maximum value of lipid (0.39 mg/g) was recorded in muscle tissue, during the period of 21 days and the minimum lipid value (0.04) was recorded in gill tissue of carp *L. rohita* during the period from 7 days.

Station – II (Treated sewage water carp fish *L. rohita*)

The total lipid content was analyzed from treated sewage water carp *L. rohita* in muscle, intestine and gill tissues during the period of 7, 14, 21 and 28 days. In the present study, total lipid values 0.46 ± 0.06, 0.62 ± 0.08, 0.47 ± 0.05 and 0.70 ± 0.04 mg/g were observed from muscle tissues (Figure 1), the total intestinal lipid values were recorded 0.17 ± 0.04, 0.24 ± 0.03, 0.31 ± 0.02 and 0.26 ± 0.05 mg/g in carp *L. rohita* (Figure 2). The total lipid values were observed in the gill tissues of 0.15 ± 0.03, 0.18 ± 0.06, 0.26 ± 0.04 and 0.28 ± 0.04 mg/g in treated sewage water carp fish *L. rohita* during the period of 7, 14, 21 and 28 days (Figure 3).

The maximum level of lipid content (0.70 mg/g) was recorded in muscle tissue of carp *L. rohita* during the period of 28 days and the minimum level of lipid content (0.15 mg/g) was recorded in gill tissue of *L. rohita* for a period of 7 days (Figure 3).

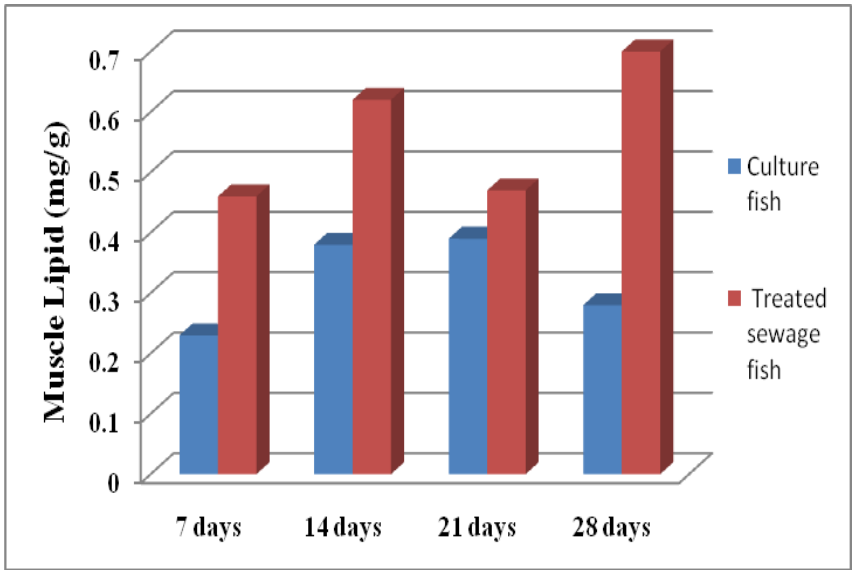

Figure 1. Total lipid content of muscles (mg/g) in tissues of freshwater and treated sewage water fish *Labeo rohita*.

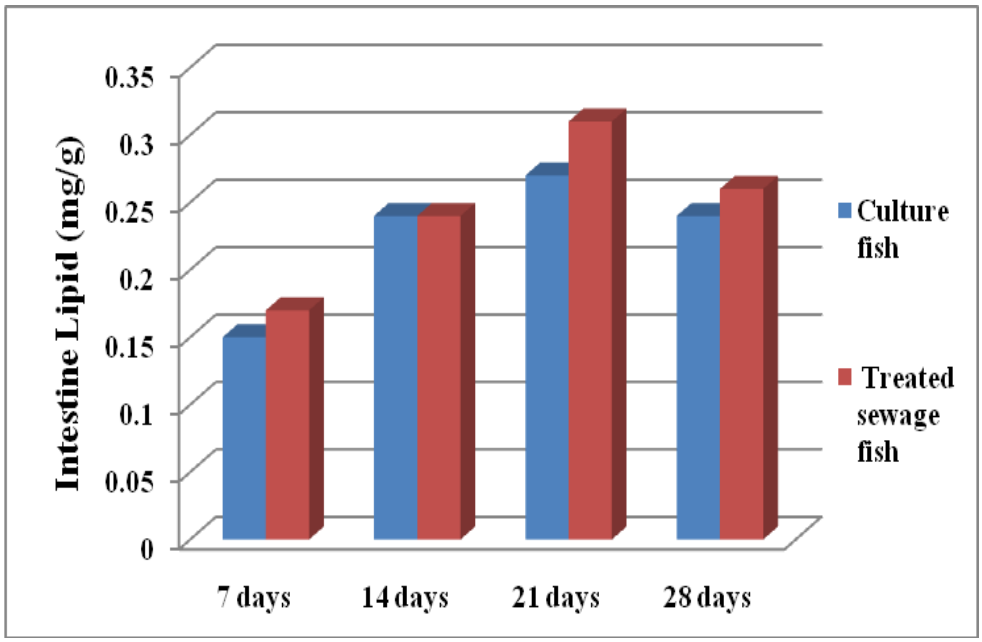

Figure 1. Total lipid content of intestine (mg/g) in tissues of freshwater and treated sewage water fish *Labeo rohita.*

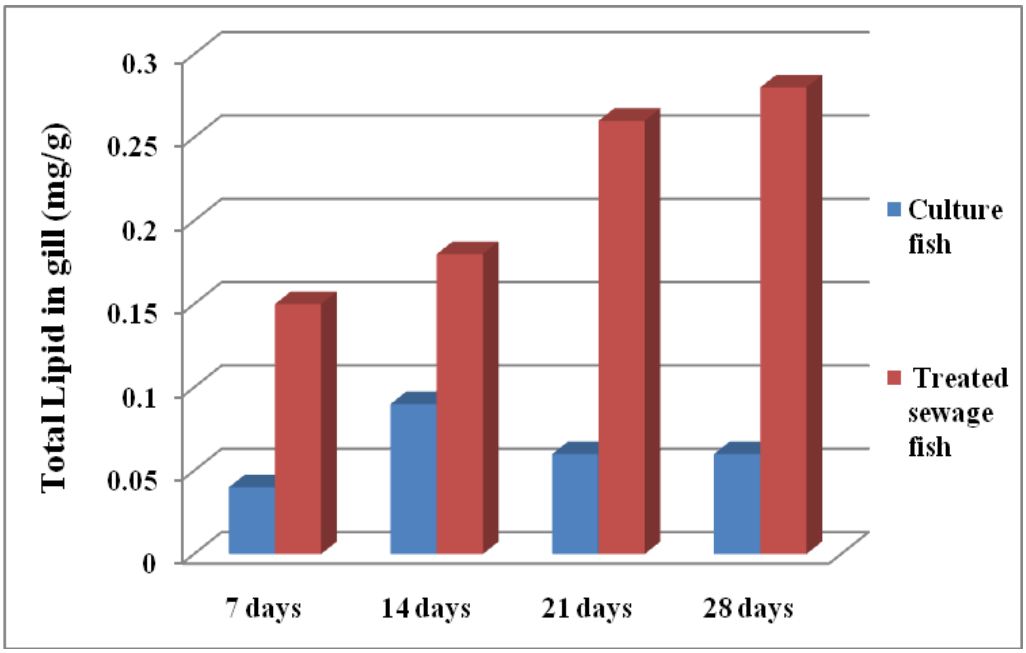

Figure 3. Total lipid content of gill (mg/g) in tissues of freshwater and treated sewage water fish *Labeo rohita.*

DISCUSSION

Biochemical responses can be affected by environmental factors, such as physico-chemical profiles of aquatic medium, seasons, fish nutrition status, age and health (Lohner *et al.*, 2001). Higher feed intake refers to disturbance in metabolism. Variations in the energy reserves (lipids) are indicative of long term exposure of toxicant stressor (Mayer *et al*., 1992).

In the present study, Lipid content maximum was recorded in muscle tissue of *L. rohita* (treated sewage water fish) and minimum level of lipid content was recorded in the gill tissue of *L. rohita* (Freshwater culture fish). Lipid content was recorded in different tissues such as muscle, gill and intestine of *L. rohita*. All the tissues, maximum level of lipids were observed in sewage treated water fish when compared that the freshwater culture fish during the study period. Similarly it was reported by (Stickney and Hardy, 1989). Lipids are also the storage form of energy's like glycogen. The lipid levels also decreased in the tissues of intestine and gills of fish when compared to the muscle tissue of fish (Peyami *et al.*, 2006).

The results of the present study showed that when the fishes were exposed to freshwater culture carp fish and treated sewage water carp fish *L. rohita*. The total lipid content were found to be increased in the treated sewage

water pond in different tissues such as muscles, intestine and gills of carp *L. rohita*.

CONCLUSION

The present study is the baseline information of the biochemical composition of carp *L. rohita* would form a useful tool for further ecological assessment and monitoring of these freshwater and sewage treated water in Tiruchirappalli district. So the poor water quality conditions in potential problem of fish culture ponds, moreover regular fish health monitoring may also be practiced. Accordingly, it is recommended that the wastewater should be treated before discharge into this culture pond.

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REFERENCES

Anonymous, 1977. McGraw Hill Encyclopedia of Science and Technology. McGraw Hill Book Company, Inc., USA.

Banks, C., Chesshire, M. and Stringfellow, A., 2008. A pilot-scale comparison of mesophilic and thermophilic digestion of source segregated domestic food waste. *Water Sci. Technol.,* 58, 1475-1481.

Choi, S.S. and Regenstein, J.M., 2000. Physiochemical and sensory characteristics of fish gelatin. *J. Food Sci.,* 65(2), 194-199.

Davidsson, A., Lovstedt, C., La Cour Jansen, J., Gruvberger, C. and Aspegren, H., 2008. Codigestion of grease trap sludge and sewage sludge. *Waste Manage.*, 28, 986-992.

Dempson, I.B., Schwarz, C.J., Shears, M. and Furey, G., 2004. Comparative proximate body composition of Atlantic salmon with emphasis on parr from fluvial and lacustrine habitats. *J. Fish Biol*., 64, 1257-1271.

Folch, J., Lees, M. and Sloane-Stanley, 1957. A simple method for isolation and purification of total lipids from animal tissues. *J. Biol. Chem*., 226, 497-507.

Gallert, C., Henning, A., and Winter, J., 2003. Scale-up of anaerobic digestion of the biowaste fraction from domestic wastes. *Water Res.*, 37, 1433-1441.

Iacovidou, E., Ohandja, D.G., and Voulvoulis, N., 2012. Food waste disposal units in UK households: the need for policy intervention. *Sci. Environ.*, 423, 1-7.

Iqbal, Z., 2002. Proximate composition of scales, skin in wild and farmed *Catla catla* and *Labeo rohita*. M.Sc. Thesis. Department of Zoology, GC University, Faisalabad, p. 67-76.

Lohner, T.W., Reash, R.J., and Williams, M., 2001. Assessment of tolerant sunfish populations (Lepomis sp.) inhabiting selenium – laden coal ash effluents. Tissue bio chemistry evaluation. *Ecotoxicol. Environ. Sci. Safe*, 50(3): 217-224.

Mahboob, S., Liaquat, F., Liaquat, S., Hassan, M., and Rafique, M., 2004. Proximate composition of meat and dressing losses of wild and farmed *Labeo rohita* (Rohu). *Pak. J. Zool.*, 36(1), 39-43.

Mayer, F.L. Versteeg, D.J. Mckee, M.J., Folmar, L.C., Graney, R.L., Mccume, D.C. and Rattner, B.A., 1992. Physiological and nonspecific biomarkers. In: Biomarker, bio-chemical, physiological and histological markers of anthropogenic stress (eds. R.J. Hugget, R.J. Kimerle, R.A., Mehrle, P.M. Jr. and Bergman HL). Lewis, *Ann. Arbor*., pp. 5-85.

Peyami, F.Y., Afser, M.R., Nisar, S.K. and Anis, A.B., 2006. Body composition and caloric value of a teleostean fish. Etropiichthys vacha (Ham). *Aquacutl.* 7(1), 111-116.

Sahu, B.B., Meher, P.K., and Mohanty, S., 2000. Evaluation of the carcass and commercial characteristics of carps. *Aquabyt,* 23, 10-14.

Stickney, R.R. and Hardy, R.W., 1989. Lipid requirement of some warm water species. *Aquacult.*, 79, 145-156.

Stroot, P.G., McMahon, K.D., Mackie, R.I. and Raskin, L., 2001. Anaerobic codigestion of municipal solid waste and biosolids under various mixing conditions I: digester performance. *Water Res.*, 35, 1804-1816.

Zhang, B., Zhang, L.L., Zhang, S.C., Shi, H.-Z. and Cai, W.M., 2005. The influence of pH on hydrolysis and acidogenesis of kitchen wastes in two-phase anaerobic digestion. *Environ. Technol*., 26, 329-340.

Zhang, R., El-Mashad, H.M., Hartman, K., Wang, F., Liu, G., Choate, C., and Gamble, P., 2007. Characterization of food waste as feedstock for anaerobic digestion. *Bioresour. Technol*., 98, 929-935.