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Impact of Flavour Effluent on Growth And Biochemical Estimation of fish, *Tilapia Mossambica*

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ABSTRACT

An investigation has been carried out to study the parameters and its impact of untreated and treated flavour effluent on the growth (60 days) and biochemical constituents (different tissues) of fish, Tilapia mossambica. The results of physico-chemical parameters of untreated flavour effluent revealed that pH was alkaline and other parameters such as Electrical Conductivity, Total Suspended Solids, Total Dissolved Solids, Biological Oxygen Demand and Chemical Oxygen Demand were found to be beyond the permissible limits of CPCB (1995). The results of the treated effluent showed a drastic reduction in parameters compared to untreated effluent. The results of growth study of Tilapia mossambica revealed highest growth rate of the fish cultured in treated sample. The results of biochemical studies also showed the depletion of lipid followed by carbohydrates and protein content of different tissues such as gills, liver and muscle of fish exposed to 100% untreated flavour effluent when compared to control (tap water) and mild changes were recorded in tissues of fish exposed to 100% treated flavour effluent.

KEYWORDS Flavour effluent, physico-chemical parameters, Tilapia mossambica, growth, biochemical constituents.

I. INTRODUCTION

Water pollution is any undesirable change in the state of water, contaminated with harmful substances. It is the second most important environmental issue next to air pollution. Any change in the physical, chemical and biological properties of water that has a harmful effect on living things is termed as 'water pollution' (WHO, 1997). As a result of the unwanted human activities, water pollution is a growing hazard in many developing countries. A more serious aspect of water pollution is that which is caused by human activity and industrialization (Park, 2009). The aquatic environment is continuously being contaminated with toxic chemicals from industrial, agricultural and domestic activity (Begum, 2004). Fishes are important aquatic animals and are particularly sensitive to wide variety of toxicants. As fish fauna serves as a food source, it is essential to know the impact of water pollution on these organisms. Alterations in physiological and biochemical parameters of toxicant treated fish are important tool for the water quality assessment of fish culture (Hilmy *et al*., 1987). Hence this study was focused on the impact of untreated and treated flavour effluent for aquaculture (ie.) fish culture and to elucidate the changes in the different target organs like gills, liver and muscle with reference to biochemical studies.

II. MATERIALS AND METHODS

Untreated and treated flavour effluent for the above study was collected from the point where in all the effluent were discharged together from flavour company situated in Chennai, Tamil Nadu, India in polythene containers (5 litres capacity). They were brought to the laboratory with due care and stored at 25± 1°C for further analysis. The samples were collected in the month of December 2014. The physico-chemical parameters of untreated and treated flavour effluent such as colour, odour, pH, Electrical Conductivity (EC), Total Suspended Solids (TSS), Total Dissolved Solids (TDS), Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) present in the flavour effluent were studied by following the Standard methods outlined by APHA (1995).

The fingerlings of fish, *Tilapia mossambica* were brought from the hydrobiological research station, Tamilnadu Fisheries Department, Chennai. The fishes were acclimatized for a period of 10 days, fed with pelletised feed daily and provided with sufficient oxygen by aeration. The growth study of fish, *Tilapia mossambica* were conducted using 100% untreated and treated samples in terms of length, breadth and weight which were estimated for a period of 60 days by following the procedure of Jamuna and Noorjahan (2009). After growth study of fish, *Tilapia mossambica,* biochemical estimation of different organs like gills, liver and muscle of fish, *Tilapia mossambica* exposed to 100% untreated and treated flavour effluent for a period of 60 days were carried out by following the procedure of Roe (1955) for carbohydrates, Lowry *et al.* (1951) for protein and Folch *et al.* (1957) for lipid.

III. RESULTS AND DISCUSSION

The results of analysis of both untreated and treated flavour effluent are depicted in table 1. The results of the study revealed that colour of the untreated flavour effluent was brick red, odour was unpleasant, pH was alkaline in nature, EC, TSS, TDS, BOD and COD of flavour effluent were found to be higher than the permissible limits of CPCB (1995). The colour of treated flavour effluent was changed to pale yellow and odourless nature, pH has changed to neutral state and maximum reduction of EC (treated - 40.22%), TSS (treated - 73.80%), TDS (treated - 54%), BOD (treated - 74.31%) and COD (treated - 53.33%). The results of the study are in accordance with the work of Shobana and Noorjahan (2010). The results of the growth study (table - 2) of fish, *Tilapia mossambica* revealed an overall increasing trend in the length, breadth and weight of the fish exposed to control, 100% untreated and treated samples with respect to increase in the number of days of exposure.

But the growth was decreased in 100% untreated sample compared to control and biotreated sample when the exposure of *Tilapia mossambica* to individual sample is taken into consideration which may be due to toxic substances present

in the flavour effluent that has decreased the growth of fishes but maximum growth was recorded in treated sample compared to untreated sample. This is because of presence of low amount of toxic substances in treated than untreated sample.

The results of biochemical estimation of different tissues of *Tilapia mossambica* exposed to 100% untreated and treated flavour effluent are depicted in table 3. Carbohydrates, protein and lipid which constitutes the major biochemical constituents of the body play an important role in body construction and energy metabolism (Palaniswamy *et al*., 1986).

Among all the three biochemical constituents tested in the different organs (gills, liver and muscle) of the fish, *Tilapia mossambica*, lipid was more depleted followed by carbohydrates and protein. This is because lipids form an important fuel reserve stored in large quantities and is an essential component of protoplasm and even during extreme starvation, considerable amount would be extracted from the tissue (Jamuna and Noorjahan, 2009). Moreover, among the three organs of the *Tilapia mossambica,* the gills are mostly affected organ as the gills are the first organ to come in contact with toxic substances present in the effluent and they do not have any kind of covering (Ware, 1980; Singh and Singh, 1980) and vulnerable to the toxic stress to 100% untreated sample followed by liver and muscle. Severe degenerative changes were observed in different organs of T. *mossambica* exposed to 100% untreated flavour effluent compared to control and mild changes were observed in organs of fish exposed to 100% treated flavour effluent.

Table - 1
Analysis of physico-chemical parameters of untreated and treated flavour effluent

Parameters	Permissible Limits (CPCB, 1995)	Control (Untreated)	Treated
Colour	Colourless	Brick Red	Pale Yellow
Odour	Odourless	Unpleasant	Odourless
pH	5.5 - 9.0	7.5 ± 0.08	6.9 ± 0.08
Electrical Conductivity (µmhos/cm)	400	1673 ± 0.81	1000 ± 1.7 (40.22%)
Total Suspended Solids (mg/l)	100	378 ± 1.06	99 ± 0.69 (73.80%)
Total Dissolved Solids (mg/l)	2100	2500 ± 1.49	1150 ± 0.81 (54%)
Biochemical Oxygen Demand (mg/l)	30	292 ± 4.7	75 ± 1.06 (74.31%)
Chemical Oxygen Demand (mg/l)	250	450 ± 1.29	210 ± 0.75 (53.33%)

± = Standard Deviation
% = Percentage Change

Table-2
Growth (length, breadth and weight of fish, *Tilapia mossambica* exposed to control (tap water), untreated and treated flavour effluent

Days	Control (Tap Water)			Untreated			Treated		
	L (Cms)	B (Cms)	Wg (Gms)	L (Cms)	B (Cms)	Wg (Gms)	L (Cms)	B (Cms)	Wg (Gms)
O Day	11	3.5	4.0	11	3.5	4.0	11	3.5	4.0
10th Day	11.5	3.9	6.0	11.2	3.6	4.3	11.4	3.8	5.5
20th Day	11.9	4.2	8.0	11.5	3.9	4.9	11.8	4.0	7.9
30th Day	12.1	4.7	11.0	11.9	4.1	5.9	12.1	4.7	10.8
40th Day	12.6	5.1	12.0	12.0	4.3	6.5	12.6	5.0	12.8
50th Day	13.0	5.7	14.0	12.2	4.9	7.8	12.9	5.6	13.8
60th Day	13.4	6.0	17.0	12.5	5.0	10.0	13.4	6.0	16.5

L = Length (cms) B = Breadth (cms) Wg = Weight (gms)

Table- 3
Effect of untreated and treated flavour effluent on biochemical constituents of fish, *Tilapia mossambica*

Samples	Organs mg/100mg of tissue	Biochemical Constituents		
		Carbohydrates	Protein	Lipid
Control	Gills	1.301 ± 0.07	0.142 ± 0.34	0.205 ± 0.40
	Liver	1.318 ± 0.07	0.140 ± 0.34	0.160 ± 0.36
	Muscle	1.664 ± 0.01	1.547 ± 0.91	0.294 ± 0.45
Untreated	Gills	0.170 ± 0.37	0.140 ± 0.34	0.142 ± 0.34
	Liver	0.807 ± 0.38	1.136 ± 0.33	0.142 ± 0.34
	Muscle	1.342 ± 0.08	1.053 ± 0.22	0.017 ± 1.70
Treated	Gills	1.368 ± 0.06	2.470 ± 1.78	1.166 ± 0.44
	Liver	1.664 ± 0.01	1.547 ± 0.91	0.228 ± 0.41
	Muscle	1.651 ± 0.02	1.441 ± 0.79	1.111 ± 0.35

± = Standard Deviation

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