Available online at http://www.journalijdr.com

International Journal of DEVELOPMENT RESEARCH

ISSN: 2230-9926

International Journal of Development Research
Vol. 06, Issue, 11, pp.10474-10481, November, 2016

Full Length Research Article

STUDIES ON THE EFFECT OF UNTREATED SUGARCANE MILL EFFLUENT WATER ON BIOCHEMICAL AND HISTOLOGICAL CHANGES IN FRESHWATER FISH *TILAPIA MOSSAMBICA*

Baskar, S., *Subramanian, N. and Muthu, M.

PG and Research Department of Zoology, Aringar Anna Govt. Arts Collage, Cheyyar-604407

ARTICLE INFO

Article History:
Received 17th August, 2016
Received in revised form
21st September, 2016
Accepted 19th October, 2016
Published online 25th November, 2016

Key Words:
Sugarcane mill
Effluent water,
Toxicity, Protein,
Necrosis.

ABSTRACT

To understand the effect of sublethal concentration of untreated sugarcane mill effluent water on vital organs of fresh water fish *Tilapia mossambica* was selected. The biochemical studies on Brain, Muscle and Liver have been carried out. The histological studies on Brain, Gill, Liver, kidney, Testis and ovaries have also been carried out along with control group of fishes.LC_{50} value was found out before the experiment by the methods of Saptami Moitra and verma (1997). The LC_{50} was arrived for sugarcane effluent water at a rate of 7ml/lit/per day (i.e.) considered as 1/3 of LC_{50} value. After 30 days of experiment the fishes from both groups were dissected out for the analysis of biochemical and histological studies. After 30 day of experiment the concentration of protein content in the control group of fishes were showed. 157±0.23 mg/gm in Brain, 105±0.10 mg/gm Muscle and 183±0.10 mg/gm in Liver. But in the case experimental group of fishes treated with sublethal concentration of untreated sugarcane effluent water showed decreased level of protein content in the Brain 55.3±0.19 mg/gm, Muscle 60±0.10 mg/gm, and Liver 130±0.10 mg/gm wet tissue. After 30 days of experiment the Brain, Gill, Liver, kidney, Testis and ovaries showed normal configuration in control group of fishes not treated with sugarcane effluent water. But in the case of experimental group of fishes after 30 days of experiment treated with untreated sugarcane water showed marked changes in Brain, Gill, Liver, Kidney, Testis and ovaries. Broken of neural bundles and scatterly arranged glial cells were found in the brain of experimental group of fishes after 30 days of exposure. Marked edema active secretion of mucous in the gill arch and gill lamellae. The gill became reddish due to haemorrhage caused by the damage of gill capillaries owing to high. Osmolysis are found in the gills after 30 days of experiment. Severve damage and marked proliferation of liver cells and necrosis of hepatic cells in the liver were found after 30 days of exposure of untreated sugarcane mill effluent water. Great damage of renal tubules and glomerular edema were observed in kidney of experimental group after 30 days of experiment treated with sugarcane mill effluent water. Testicular inflammation, strinkage of interstitial cells and vaculation of tubular cells were found in the testis of experimental group of fishes treated with sublethal concentration of sugarcane mill effluent water after 30 days of exposure. Ovaries showed atritic follicle and degeneration of youlk granules in the ovary. The ovaries were disintegrate and the oocytes were scatterly arranged due to the effect of sugar mill effluent water.

INTRODUCTION

Sugar factory pollution is one of the important environmental problems in Tamil Nadu. The sugar industry effluent pollutes river system and well due to percolation. It is a practice that the effluent is directly discharged into water bodies without pre-treatment. Sometimes, it is stored in the fields for solar evaporation of water or directly spread on land from where it may percolate into the wells. Very little attention has been paid on effects on aquatic organisms such as biochemical and histological change in organ systems. Paul Raj (1982) reported that depletion of glycogen content in muscle and liver of *Cyprinus carpio* on exposure of factory effluent. The toxicological details with histo-pathological and biochemical change in fishes has been made by Admark *et al*., (1977). The Sugar factory effluent is chemically complex and it is difficult to understand that which chemical is actually responsible for toxicity in fish. Sugar

***Corresponding author: Subramanian, N.,**
PG and Research Department of Zoology, Aringar Anna Govt. Arts Collage, Cheyyar-604407.

industry plays an important role in the economy of Bangladesh by way of farming and creation of employment. The by-products of sugar mills are also used as raw materials in different industry. However sugar mill have a great environmental impact upon the surrounding environment. The change of water chemistry is the main associated environmental impact of discharging sugar mill's effluent on an open water body. The effluents are causing odour nuisance during decomposition. Wastewater from sugar mills with its high Biological oxygen demand (BOD) and chemical oxygen demand (COD) rapidly deplete available oxygen supply when discharged into water bodies endangering fish and other aquatic life and also creates septic conditions, generating foul-smelling hydrogen sulphide, which in turn can precipitate iron and any dissolved salts, turning the water block and highly toxic for aquatic life. Suspended solids reduce light penetration capability and, as a result, plant production in the receiving water body is diminishing through increasing turbidity that also clog fish gills. Discharge of water with a high total dissolved solids (TDS) level would have an adverse impact on aquatic life, render the receiving water unfit for drinking and domestic purpose, reduce crop yields if used for irrigation, and exacerbate corrosion in water system and pipe (ETPI, 2001).

The effluents from sugar mills are discharging without treatment into freshwater bodies which makes poor water quality. This polluted water is utilized by human for drinking, domestic, agriculture and industrial purposes. Sugar factories are based on agriculture which are playing major role for strengthening national economy and social development of a country (Bevan, 1971), and (Hendrickson, 1971). The activities of sugar mills require huge quantum of fresh water for milling process and subsequently releasing of bulk effluent into the environment. Factories are consumers of huge volume of freshwater; wastewater contains high level of contaminations such as, suspended solids, organic and inorganic matter and chemicals. Most chemicals used in sugar processing are toxic; if not well treated might ultimately find their course into the streams which make poor quality of fresh water bodies Sugar and Distillery Wastes- In the process of manufacture of sugar, extracted juice of sugarcane is treated with lime and sulphur dioxide (known as carbonation and sulphitation process) for clearing various unwanted ingredients such as lime salts, coagulated albumen made up of varying proporation of fats and waxes, and also the colouring matters (Producing by decomposition of reducing sugar). Sugar mill effluent contains carbonaceous sugar matter, fibre, lignin, cellulose, and lime, phosphate of calcium, lactic acid and oil (David and ray, 1966). Lime and sulphur-di-oxide used for clearing and bleaching process in sugar mills contribute to the high calcium and sulphate contents of the effluent.

The literature reflects that the discharge of sugar mill effluent caused deoxygenating and mortality of fish and other aquatic organisms along the course of the river. Sugar mill waste released into the river created anaerobic condition and low red ox potential in the water and constant supply of sulphate from the waste produced hydrogen sulphide by the activity of sulphur reducing bacteria. This lead of fish mortality up to 3km downstream from the point of discharge. The extent of pollution caused by sugar mill effluent depends on the volume of effluent discharged and amount of organic waste contained in it. Wastewater aquaculture practices is possible through consideration of the socio psychological dimension, based on which two distinct categories can be defined first, direct reuse, the planned and deliberate use of wastewater as an nutrient and water resources, secondly, indirect reuse, without recognition of its previous use, in waterways contaminated or indirectly enriched through wastewater. The industrial wastes generally contains high quantities of dissolved and suspended solids, organic and inorganic chemicals, high BOD and COD, oils and grease, besides toxic metals which cause deleterious effect on the freshwater fish when discharged into water bodies. Srivastava (1982) studied comparative effect of copper, cadmium and mercury on tissue glycogen of cat fish *Heteropnuestes fossils.* Decrease in protein, free amino acids and free sugars of haemolymph was more, when the fresh water prawn, *Macrobrachium idella* was exposed to higher concentration of tennery effluents (Subramanian and Varadaraj,1993). Ambrose *et al*. (1994), also observed decline in carbohydrate, protein and lipid content of gill, liver, intestine and kidney of *Cyprinus carpio.*

Communities under the toxic stress of sub lethal concentration of composite tannery effluent. Recorded significant decrease in glycogen, total protein and lipid in both liver and muscle tissue of fish with an increase in effluent concentration after exposure of fish, *Channa punctatus* (Blotch) to distillery effluent. Heavy metals entering aquatic ecosystem through industrial wastes, mining, agricultural development, and fossil fuel combustion can have a wide range of adverse effect on aquatic communities (Adakole, 2000). Metal contamination of aquatic ecosystems has long been recognized as a serious pollution problem. When fish are exposed to elevated levels of metal in a polluted aquatic ecosystem, they tend to take these metals up from their direct environment (Adakole and Abolude, 2009). Heavy metal contamination may have devastating effects on the ecological balance of the recipient environment and a diversity of aquatic organisms (Ashraj, 2005). The fore going review of Literature clearly showed the effluent from Industries caused mild to moderate damage in both biochemical and histological parameters. When aquatic organisms are expressed to polluted environment.

MATERIALS AND METHODS

To study the sub-lethal (7ml/litre/day) effects of untreated sugarcane effluent water to the fresh water fish *Tilapia mossambica* was selected as an experimental animal. Totally 60 numbers of healthy male and female fishes were selected. The body weights of the fishes are ranging between 10-15gms and a total length of 8-10cm were collected from the local lake of Parasur village Cheyyar Taluk, Thiruvannamalai district. The fishes were brought to the laboratory with care and acclimatized for laboratory condition. After acclimatization the fishes were transferred to the plastic tub of 20 litre capacity. They were grouped in to 6, each tub containing 10 fishes were maintained at room temperature. Then the fishes were treated with various concentration of sugarcane water to observe the LC_{50} and the biochemical as well as histological changes. Each group was exposed to gradually increased concentration (i.e) 5ml, 10ml, 15ml, 20ml, and 25ml for 4 days (i.e) 24, 48, 72 and 96 hrs. Before the mixing of effluent water in various tubs, the biochemical parameters such as Protein, Glucose and Glycogen content were analysed by adopting the method of Lowry *et al*., (1951). The histological study was followed by the method of Humason (1972). In the present study of sugarcane effluent water was used as an experimental agent to study about its effect on biochemical and histological changes to the fresh water fish *Tilapia mossambica*. After 96 hrs of exposure with effluent water the mortality determine the LC_{50} (fifty percent lethal concentration), *Saptami Moitra* and *Verma* (1997) standard method was followed.

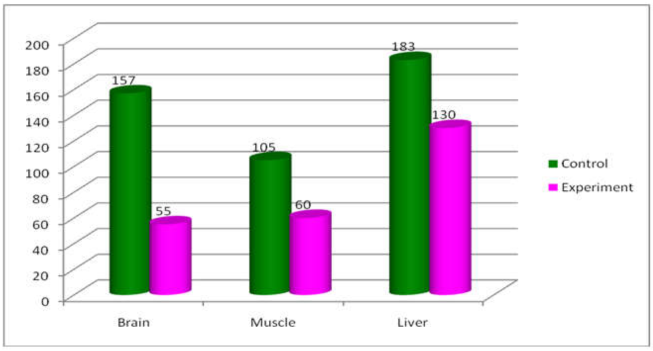
RESULTS

The biochemical analysis of protein, Glucose and Glycogen in Brain, Muscle and Liver of control and experimental (sub lethal concentration of Sugar Cane Mil effluent water 7 ml/lit/day group of fishes *Tilapia mossambica* male and female are given in Table 1-3 and Figure 1-3.

Table 1. Shows the protein concentration in Brain, Muscle and Liver of control and Experimental (Treated with Untreated Sugar Cane Mill Effluent Water) Group of Fish *Tilapia mossambica*

Sl.NO	Organ	Protein Concentration mg/gm	
		Control	Experiment
1	Brain	157±0.23	55.3±0.19
2	Muscle	105±0.10	60±0.10
3	Liver	183±0.10	130±0.10

$\overline{X} \pm$ SD

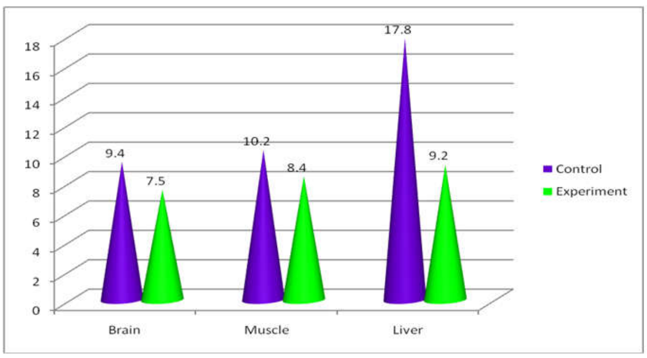


Graph 1. Shows the protein concentration in Brain, Muscle and Liver of control and Experimental (Treated with Untreated Sugar Cane Mill Effluent Water) Group of Fish *Tilapia mossambica*

Table 2. Shows the Glucose concentration in Brain, Muscle and Liver of control and Experimental (Treated with Untreated Sugar Cane Mill Effluent Water) Group of Fish *Tilapia mossambica*

S.NO	Organ	Glucose Concentration mg/gm	
		Control	Experiment
1	Brain	9.4±0.1	7.5±0.1
2	Muscle	10.2±0.1	8.4±0.1
3	Liver	17.8±0.1	9.2±0.1

$\overline{X} \pm$ SD

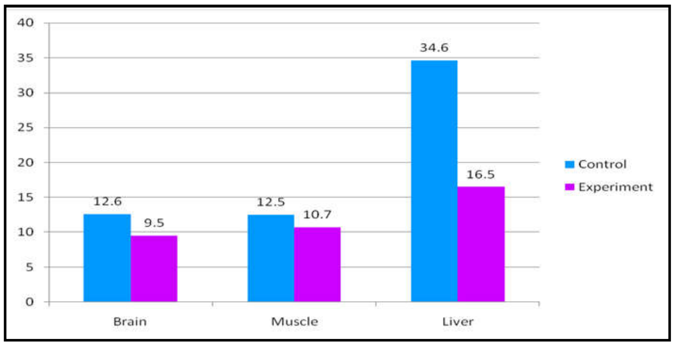


Graph 2. Shows the Glucose concentration in Brain, Muscle and Liver of control and Experimental (Treated with Untreated Sugar Cane Mill Effluent Water) Group of Fish *Tilapia mossambica*

Table 3. Shows the Glycogen concentration in Brain, Muscle and Liver of control and Experimental (Treated with Untreated Sugar Cane Mill Effluent Water) Group of Fish *Tilapia mossambica*

S.NO	Organ	Glycogen Concentration mg/gm	
		Control	Experiment
1	Brain	12.6±0.1	9.5±0.1
2	Muscle	12.5±0.1	10.7±0.1
3	Liver	34.6±0.1	16.5±0.1

$\overline{X} \pm$ SD



Graph 3. Shows the Glycogen concentration in Brain, Muscle and Liver of control and Experimental (Treated with Untreated Sugar Cane Mill Effluent Water) Group of Fish *Tilapia mossambica*

It is understood from the Table-1 and Figure-1. The protein content in the Brain, Muscle and Liver of control and experimental group of fishes showed 157 ± 0.23 mg/gm, 105 ± 0.10 mg/gm and 183 ± 0.10 mg/gm respectively on 0^{th} day of experiment. Before starting the experiment.

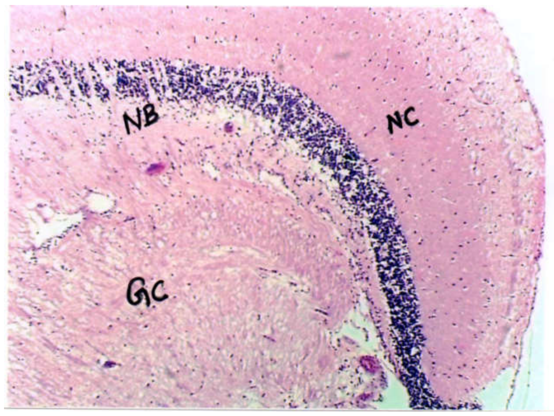


Fig. 1. Control Brain

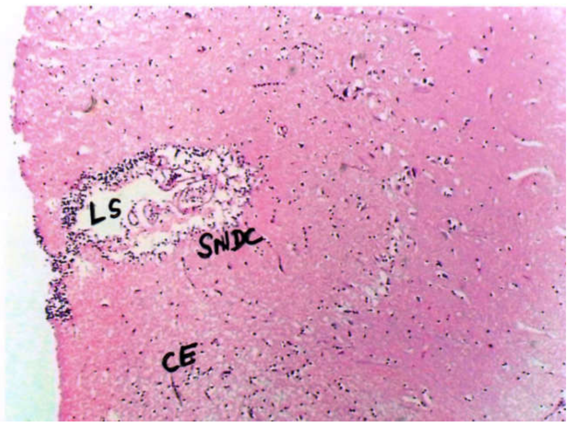


Fig. 2. Experiment Brain

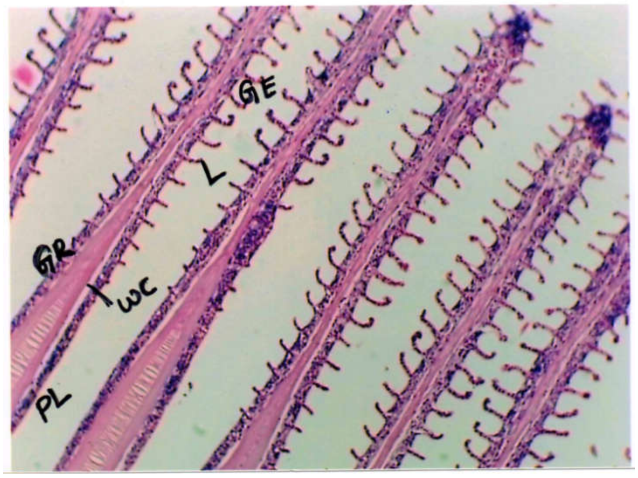


Fig. 3. Control Gill

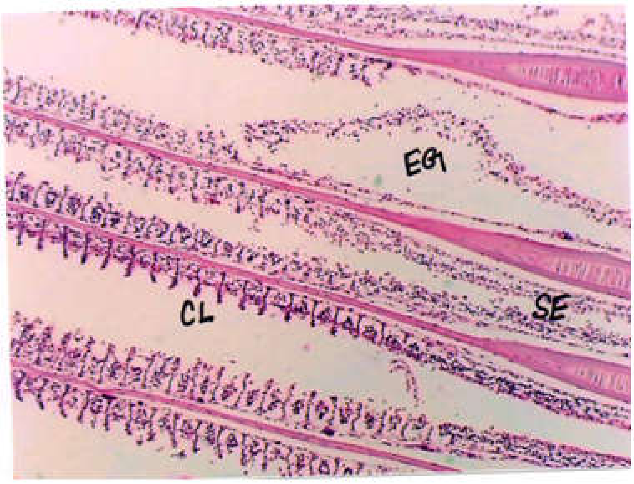


Fig. 4. Experiment Gill

But in the case of experimental group of fishes treated with Sugarcane Mill effluent water showed decreased level of protein content in all the tissues. In the Brain from 157 ± 0.2mg/gm to 55 ± 0.19 mg/gm, in the Muscle from 105 ± 0.10mg/gm to 60 ± 0.10mg/gm and in the Liver from 183 ± 0.10mg/gm to 130 ± 0.10mg/gm. This was due to the animal under stress condition. The results are in agreement with those Ambrose *et al.,* (1994). They observed decreased level of carbohydrate, Protein and Lipid content in the gill, liver, intestine and Kidney of *Cyprinus carpio* under stress condition. From Table 2 and Figure 2 it is clearly understood that the Glucose content in the Brain. Muscle and Liver of fresh water fish *Tilapia mossambica* of both control and experimental group of fishes were showed 9.4 ± 0.1mg/gm, 10.2 ± 0.1mg/gm and 17.8 ± 0.1mg/gm respectively, at 0^{th} day of experiment before treating with sub lethal concentration of Sugar Cane Mill effluent water.

At the 30^{th} day of experiment the control group of fishes not treated with Sugar Cane Mill effluent were showed same level in all the tissues like, Brain 9.4 ± 0.1 mg/gm, Muscle 10.2 ± 0.1 mg/gm and Liver 17.8 ± 0.1 mg/gm. But is the case of experimental group of fishes treated with Sugar Cane Mill effluent water decreased level of Glucose content in Brain 7.5 ± 0.1 mg/gm, in Muscle 8.4 ± 0.1mg/gm and Liver 9.27 ± 0.1 mg/gm. The results are in agreement with those of Rajan (1990) they recorded that protein, carbohydrate and lipid content were decreased significantly in the Muscle, Liver and Intestine of *Cyprinus carpio* under exposed to sub lethal concentration of textile mill effluent water. Glycogen content in control and experimental group of fishes at 0^{th} day and 30^{th} day of experiments are given in Table-3 and Figure-3 from the Table and Figure it in evident that at 0^{th} day of experiment both the group of fishes showed same level of glycogen content in the Brain 12.6 ± 0.1 mg/gm, 12.5 ± 0.1 mg/gm and Liver 34.6 ± 0.1mg/gm respectively.

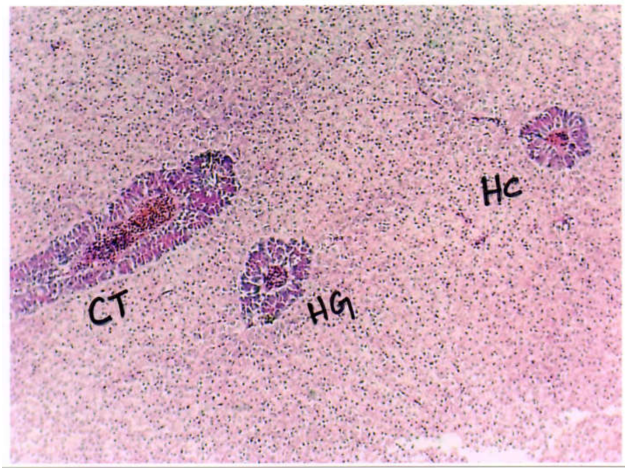


Fig. 5. Control Liver

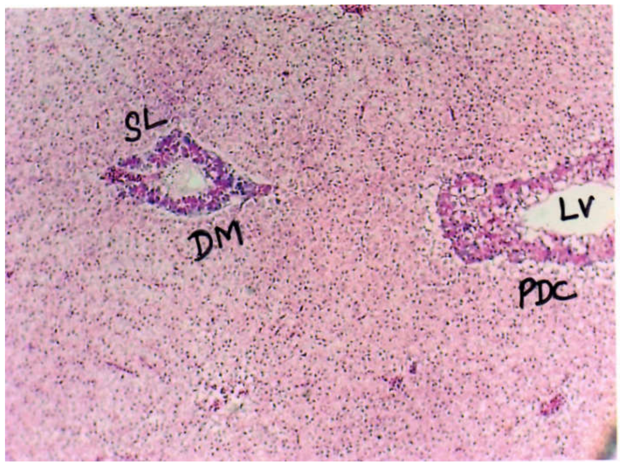


Fig. 6. Experiment Liver

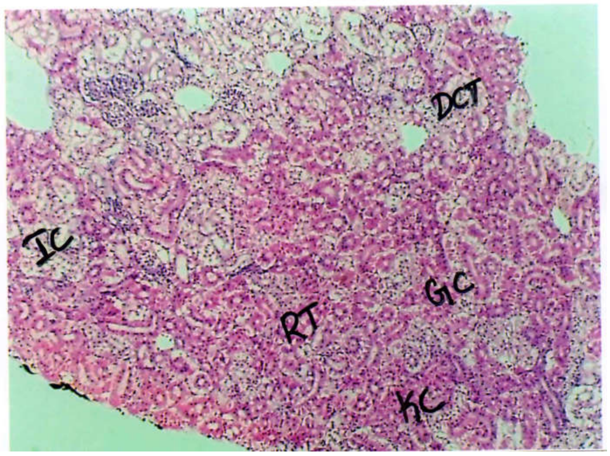


Fig. 7. Control Kidney

At the end of 30^{th} of experiment the control group of fished showed same level of glycogen content in the Brain, Muscle and Liver 12.6 ± 0.1 mg/gm, 12.5 ± 0.1 mg/gm and 34.6 ± 0.1

mg/gm, respectively. But in the case of experiment group of fishes treated with sub lethal concentration Sugar Cane Mill effluent water showed low level of Glycogen content in all the tissues. Brain from 12.6 ± 0.1mg/gm, to 9.5 ± 0.1 mg/gm, Muscle from 12.5 ± 0.1 mg/gm to 10.7 ± 0.1 mg/gm and Liver from 34.6 ± 0.1 mgd/gm to 16.5 ± 0.1 mg/gm. The results are in agreement with those of Paul Raj (1982). They concluded that depletion of Glycogen content in the Muscle and Liver of *Cyprinas Carpio* fish exposed to factory effluent water.

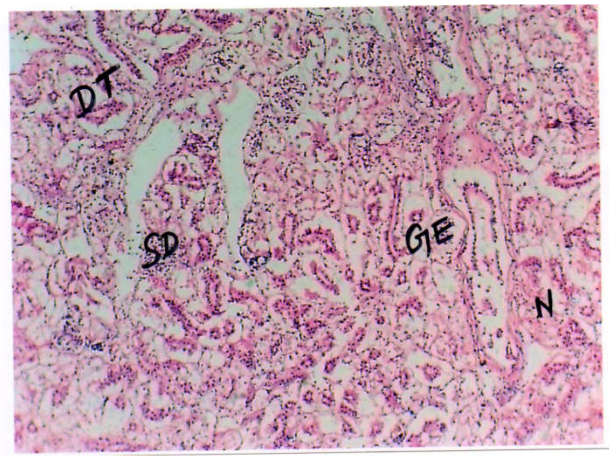


Fig. 8. Experiment Kidney

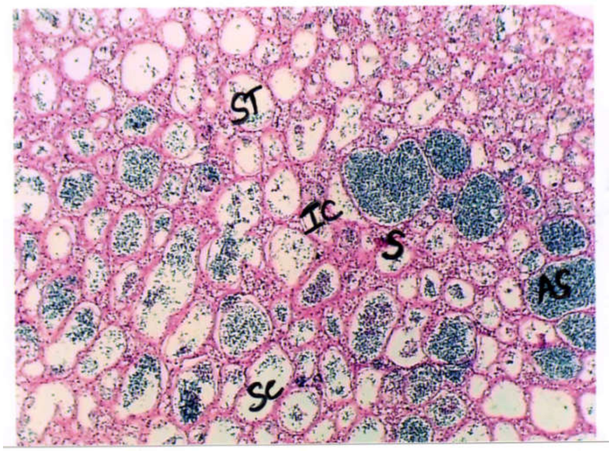


Fig. 9. Control Testis

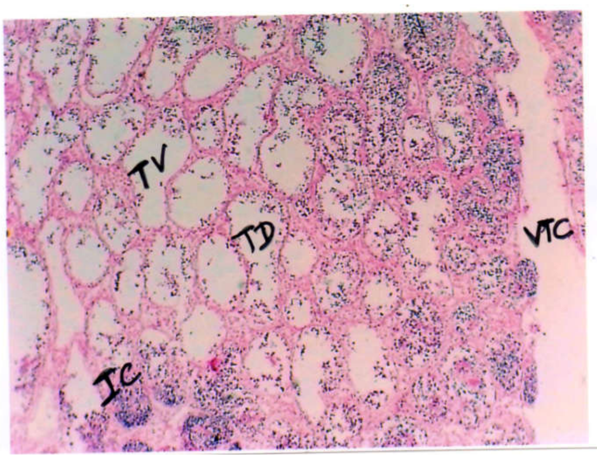


Fig. 10. Experiment Testis

Histological Study

The histological study in the brain, gill, liver, kidney, testis and ovary of *Tilapia mossambica* in control and Experimental group of fishes (Treated with untreated sugar cane mill effluent water) have been analysed. Histological sections were stained with Haematoxylin and Eosin. The results are given in Figure 1 to12.

Histology of Control fish Brain

The histology of control fish brain was given in Figure 1. In control fish the brain showed uniformly arranged neural cells and brain cells. In some areas the neural cells were unit to form neural bundles. The neural bundles were regularly arranged. The brain showed many glial h cells which are scatterly arranged. The brain showed normal exostructure.

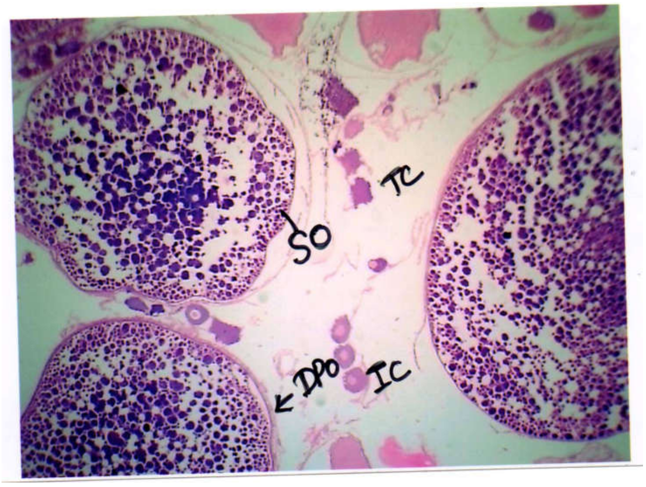


Fig. 11. Experiment Testis

Histology of Experimental fish Brain

The histology of experimental fish brain was given in Figure 2. The experimental fish brain treated with untreated sugar cane effluent water after 30 days showed severe damage in the neural cells. The neural bundles were broken and neural cells were scatterly arranged. The glial cells were reduced into small cells the cell edema were observed. Many areas of the brain were showed without neural cells and neural bundles.

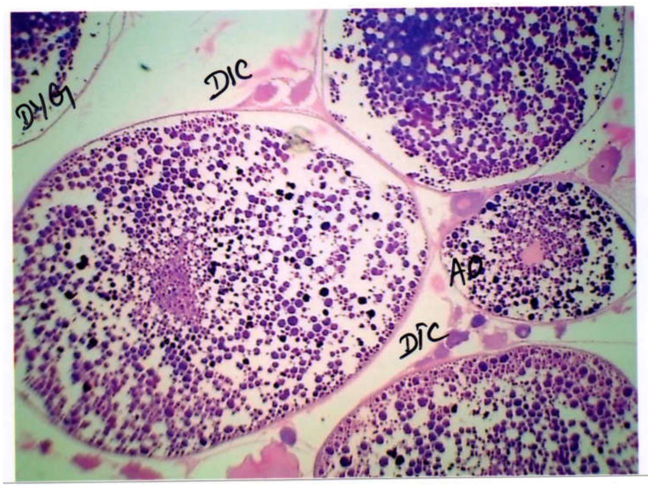


Fig. 12. Experiment Ovary

Histology of Control fish Gill

The histology of control fish gill *Tilapia mossambica* is given in the Figure 3. In control fish the gill showed four pairs of gill lamellae on both the sides. They are supported by bony structure and primary lamellae. The secondary lamellae showed numerous channels of blood capillaries each separated by single layered pillar cells when observed in vertical section. The laminar epithelium was thick followed by basement membrane below which the pillar cells enclosed blood spaces, large number of muscle cells were present on the epithelial gill rocker, where as primary lamellae had comparatively small and less number of mucous cells.

Histology of Experimental fish Gill

The histology of experimental fish gill is given in Figure 4. The experimental fish treated with untreated sugarcane effluent water for 30 days gill showed severe damage in gill lamellae, marked edema and active secretion of mucous cells, increased in size but decreased in number and most of them were either vacuolated or almost empty. The secondary lamellae are also showed destruction of either epithelial cells or most lamellae were curled that leads to congestion and haemorrhage of gills. The experimental fish gill became reddish in colour.

Histology of Control fish Liver

The histology of control fish liver (*Tilapia mossambica)* was given in the Figure 5. The control fish liver showed normal arrangement of hepatic cells, the connective tissue of liver expressed normal in condition, the connective tissue of liver expressed normal in condition, the hepatic mass showed normal granulation and showed uniformly arranged hepatic cells. In the pancreatic tissue no changes were noticed.

Histology of Experimental fish Liver

The histology of experimental fish liver of *Tilapia mossambica* was given in Figure 6. In the experimental fish treated with untreated sugarcane effluent water after 30 days liver showed proliferation of ducted cells and small spaces were appeared in between hepatic cells.

The liver cells showed severe damage and marked proliferation and oedema. The liver tissue was converted into degenerative mass and cells were showed scattered in nature. The pancreatic tissue was broken and large vacuoles were seen.

Histology of Control fish Kidney

The histology of control fish kidney of *Tilapia mossambica* was given in Figure 7. The control fish kidney showed well differentiated glomerular tissue with closely arranged renal tubules including distal and collecting tubules. The kidney showed intact of interstitial cells and kupffer cells.

Histology of Experimental fish Kidney

The histology of experimental fish *Tilapia mossambica* kidney was given in Figure 8. The fishes were treated with untreated sugarcane effluent water after 30 days kidney showed mild to moderate edema. The cell sizes were reduced and glomerular tissue remained more or less intact. Severe damage was found in renal tubules and interstitial cells. The disorganization of tubules was also seen. The glomerular edema and necrosis were also noticed in the experimental fish kidney treated with sugarcane mill effluent water after 30 days they showed marked edema.

Histology of control fish testis

The histology of control fish Testis of *Tilapiamossambica* (male) was given in Figure 9. The control fish testis showed normal arrangement, Testis of Tilapia mossambica are paired organs found in the abdominal region and each enclosed in a peripheral connective tissue sheath. The inner most layer of this sheath, tunica propria, project into the lumen of testis forming the seminiferous tubules, These tubules are lined internally with tubular (or) seminiferous (or) spermatogonic epithelium which gives rise to spermatocytes. This spermatocytes are later transformed into next development stage of spermatids and then to spermatozoa. Masses of spermatozoa can be seen lodged in seminiferous tubules, located at the blind ends of seminiferous tubules. This lobular part can be distinguished in to somatic cells and germ cells. The central portion of the testis is made up of glandular tissue consisting of large and spherical interstitial glandular cells, fibroblast, blood and lymph vessels.

Histology of experimental fish testis

The histology of experimental group of fish testis given in the Figure 10. The experimental fish testis showed significant changes when exposed to untreated sugarcane mill effluent water after 30 days. Extensive cytotoxic damage, general inflammatory response and other histological abnormalities are quite predominant. The presence of large, number of both inter and intra-tubular vacuoles. Gross condensation of spermatogenic cells, which is evident by dump formations and appearance of inflammatory lesion are also quite predominant. The extent of vacuolation in tubular epithelium increase. Inflammatory cells are seen in the testicular tissue of every treated fish.

Histology of control Fish Ovary

The histology of control fish *Tilapia mossambica* ovary was given in Figure 11. The control fish ovary showed many developing primary and secondary oocytes. The oocytes have large number of yolk granules. The yolk granules were uniformly distributed some oocytes showed yolk globules. In between the developing oocytes many interstitial cells and theca cells were also seen. The oogonia were lesser in number. The epithelium of oocytes showed hyperactive in nature.

Histology of Experimental fish Ovary

The histology of experimental fish *Tilapia mossambica* treated with untreated sugarcane effluent water ovary was given in Figure 12. In experimental fish ovary after 30 days of treatment showed marked damage in the oocytes. The primary and secondary oocytes were disintegrated and the yolk granulues were disappeared. The oocytes lost their differentiation. The interstitial cells and thecal cells were degenerated. The oogania were disappeared. Many atretic oocytes were seen. Atrophy occurred in the ovary.

DISCUSSION

Water resource has been the most exploited natural systems since man stored the earth. With the rapid development of industrialization and an incase in human pollution. The pollution of water bodies has become a universal phenomenon in the present day world. Water quality of the coastal areas, estuaries and Major River around the world is getting rapidly degraded due to massive discharge of industrial wastes of diverse origin, domestic sewage, mine drainage, oil spills, extensive use of agro-chemicals and use of distractive fishing techniques etc. Development of coastal towns an industry, aquaculture, dredging of sea floor etc., has resulted in degradation of land and mangrove forest. Human interference has also exerted adverse impact on river and lake ecosystem. This anthropogenic activity leads to depletion of oxygen in water, elevated BOD load, changes in transparency, pH, phosphate, nitrate, COD and mineral concentration causing rapid eutrophication and degrading water quality. This unabated exploration of ecosystem is exerting tremendous strain on aquatic communities including plankton, fishes and other invertebrates. In recent years a varieties of nutrient carriers have been used for optimum growth of fish as well as overall productivity in fish culture (Brady, 1991). When too much nutrient carries (organic and inorganic) are used for fish culture, a substainal amount is lost through several ways and may become pollutants. Therefore, a large application of nutrient carries may become hazardous to fish (kumaraiah *et al.,* 1997).

Although inorganic fertilizers and organic manure contain various essential elements, all of them are not necessary for fish growth, so need to be conserved and carefully managed (Brady, 1991). Organic substances such as plant materials, food scraps and paper products can be recycled using a biological process. The intention of biological processing is to control and accelerate the natural process of decomposition of organic matter. Sugarcane bagases is the fibrous residue remaining after sugarcane stalks are crushed to extract juice and currently used as renewable resource in the manufacture of pulp, paper products and building materials. Sugarcane bagases, by-products of sugar industry is generated in large quantities which can be used as potential nutrients enriched resource for the growth of periphytons in fish ponds (Wahabi *et al.,* 1999). Moreover, among protein sources available wastes are most important because they are available in plenty and are left unnoticed. The bioavailability and richness, the available nutrients from the wastes are to be evaluated. *Heteropneustes fossils*, commonly known as stinging catfish or singhi, is considered one of the most highly demanded freshwater air breathing fish species in the subcontinent and south east Asian region. The fry and fingerlings of the Indian catfish are difficult to collect from natural water bodies. Such carnivorous species generally need a high protein diet and hence, their production is expensive.

The costs, however, depend largely on local availability and the price paid greater export value attracting substainal investments. Hardy species and can tolerate unfavourable conditions and have the advantage of better survival in relatively poor environmental conditions that may occur occasionally in cultural situations. The ability of H.fossils to adapt to fresh and brackish water with very low oxygen content to grow under generally poor environmental conditions make these fish extremely valuable for small and large scale rural fish farming (Pillay, 2001). The present investigation is concerned with the effect of sugarcane mill effluent water totally damaged the biochemical constituent and affect the histological parameters. The results are in agreement with those of Paul Raj (1982), and Wahabi (1998) and Rajan (1990). Paul Raj (1982) reported that depletion of glycogen content in the Muscle and Liver of Cyprinus Carpio fish exposed to factory effluent water. Wahbi (1998) noted that the haemolytic anaemia occurred in the fish when exposed to Industrial effluent water and Rajan (1990) recorded that Protein, Carbohydrate and Lipid content were decreased significant in the Muscle, Liver and Intestine of Cyprinus Carpio under expossed to sublethal concentration of textile mill effluent. Changes in biochemical may alter or reflect in histology also.

REFERENCE

Adakole, J.A. 2000. The effects of domestic, agricultural and industrial effluents on the water quality and biota of Bindare stream, Zaria - Nigeria. PhD thesis, Dept. of Biological Sciences, *Ahmadu Bello University,* Zaria. pp: 256.

Adakole, J.A. and Abolude, D.S. 2009. Studies on effluent Characteristics of a metal finishing company, Zaria *Environmental Research*. 1(2), 54-57.

Admerk R., Lmirch D., Verma J. and Trillova B. 1977. Preliminary text influence of waste water from sugar factories on number of intestinal bacteria in water., *Mcd.,* 146 (1): 340-350.

Allen, P. 1994. Changes in the haematological profile of the cichlid Oreochromisaureus (Steindachner) during acute inorganic mercury intoxication. *Comparative of Biochemistry and Physiology.* 108: (1), 117- 121.

Ambrose, T., L. Cyril, A Kumar, S Vixent and R. Lambent., 1994. Biochemical response of cyprinus carpio (communis) to toxicity of tannary effluent *Journal of Exobiology.* 6(3), 213-216.

Ashraj, W. 2005. Accumulation of heavy metals in kidney and heart tissues of Epinephelusmicrodon fish from the Arabian Gulf. *Environmental Monitoring Assess.* 101(1-3), 311-316.

Bevan, 1971. The disposal of sugar mills effluents in Queensland 40th proceeding of the T.S.S.C.T. Lousinia, pp: 1508-1516.

David, A. and P. Ray. 1966. Studies on the pollution of the river Daha (N.Bihar) by sugar and distillery wastes. *Environmental Heath*. 3: 153-156.

Ebeling, G. 1931. Recent results of the chemical investigation of the effect of waste water from cellulose plant on fish. *Vom Wasser.* 5:192-200.

ETPI. 2001. Environmental technology program for industry “Environmental Report on sugar Sector”. *Monthly Environmental News.* 5(7): 11-27.

Fletcher, TC, and White, A., (1986). Nephrotoxic and haematological effects of ercuric chloride in the plaice (Pleuronectesplatessa). *Aquatic Toxicology*. 8, 77-84.

Hendrickson, 1971. “New sugar factory waste and their control” in 40th proc. The T.S.S.C.T. *Lousinia.* Pp:1552-1559.

Humason G.L. 1972. Animal tissue technique. TTT Edi. WH Freeman and co. sanfrancisco.

Juneja, CJ, and Mahajan, CL., 1983. Hematological and haemopoietic changes in fish Channapunctatus due to mercury pollution in water. *Indian Journal of Animal Research.* 17(2), 63-71.

Keshwanth, P., Gangadhar, B., Rmesh, T.J., van Rooji, J.M., Beveridge, M.C.M., Baird, D.J., Verdegem, M.C.J. and van Dam, A.A., 2001. Use of the artificial substrates to enchance production of freshwater herbivorous fish in pond culture. *Aquaculture Research*. 32: 189-197.

Kikrayakov, VR ,and Lapirova, TB. 1996. Influence of salts of some heavy metals on the differential blood count in Juvenile Acipenserbaeri. *Journal Ichthyology*. 37(6), 458-462.

Kumaraiah, P., Chakrabarthy, N.M. and Radhavan, S.L., 1997. Intederated aquaculture with agriculture (animal and plant crop) components including processing of organic waste and their utilization. *Fish Chemistry.* 17: 19-20.

Lowry O.H., Resebrough, N.J., Farr, A.L and R.J.Randall, 1951. Protein measurement with folin phenol reagent. *Journal of Biological Chemistry*, 93,pp 265-275.

Menezes, MR, and Qasim, SZ. 1984. Effects of mercury accumulation on the electrophoretic patterns of the serum, haemoglobin and eye lens proteins of Tilapia mossambica (Peters). *Water Research.* 18(2), 153- 161.

Nussey, G, Van Vuren, JHJ, and du Preez, HH. 1995. Effect of copper on the haematology and osmoregulation of the Mozambique tilapia, Oreochromismossambicus (Cichlidade). *Comparative of Biochemistry and Physiology*. 111C: (3), 369-380.

Oliveira-Ribeiro, CA, Neto, FF, Mela, M, Silva, PH, Randi, MAF, Rabitto, I.S Alves Costa, JRM, and Pelletier, E., 2006. Hematological findings in neotropical fish Hopliasmalabaricus exposed to subchronic and dietary doses of methylmercury, inorganic lead, and tributyltin chloride. *Environmental Research*. 101, 74-80.

Paul Raj S. 1982. Studies of the effect of paper factory effluent on the hydrography of river cauvery and its toxicity to common crap Cyrinus carpio var, Communication (Linneary), Ph.d. Thesis., Tamil Nadu, *Agriculture University Coimbatore.* 127.

Rajan, M.R. 1990. Sub lethal effects of textile mill effluent of protein, carbohydrate and lipid content of different tissues of fish cyprius carpio, *Environmental Ecology.* 8(1), 54-58.

SaptamiMoitra and H.K Verma, 1997. Toxicity of heavy metalic salt to millions fishes Labistereticulatus (peter). Recent advantages in Ecological Research, A.P.JKJ. Pulishing Corporation, New Delhi pp: 474-477.

Shakoori, AR, Iqbal, MJ, Mughal, AL and Ali S.S. 1994. Biochemical changes induced by inorganic mercury on the blood, liver and muscles of freshwater Chinese grass carp, Ctenopharyngodon idella. *Journal of Eco toxicology and Environmental Monitory*. 4(2), 81-92.

Srivastava, H.D., 1945. A survey of the Incidence of helminth infection in India at the Imperial Veterinary Research Institute, Izatnagar. *Indian Journal of Veterinary Science.*15:146-148.

Subramanian, M.A. and Varadaraj, G, 1993. The impact of tannery effluent on the biochemical constitutents in the haemolymoph of fresh water prawn Macrobrachium idella (Heller). *Journal of Environmental Biology*. 14(4):257-267.

Van Horn, W.M. 1961. Aquatic biology and the pulp and paper Industry (Rep, No. 2). Nail. Counc. Of paper industry for Air Stream Improve; New York, N.Y. *Stream improvement Technology Bulletins*. 251:45.

Wahabi, M.A., Azim, M.E., Ali, M.H., Beveridge, M.C.M. and Khan, S. 1998. The potential of periphyton-based culture of the native major carp calbush, labeo calbasu (Hamilton). *Aquaculture Research*. 30: 409-419.

Walden, C.C. 1976. The toxicity of the pulp and paper mill effluent and corresponding measurment procedures. *Water Research*. 10(8): 639-664.

****