International Journal
of Pure & Applied
Bioscience

Toxicity of Industrial Wastage in Fresh Water Ecosystem

B. Ramesh and M. Aruna[*]

Hydrobiology and Algal Biotechnology Laboratory, Department of Botany, Telangana University, Dichpally, Nizamabad, Telangana State, India
*Corresponding Author E-mail: drarunatu@gmail.com

ABSTRACT

An attempt was made to know the effect of different concentrations of sugar mill effluent on aquatic ecosystem. Industrial pollution has been continues to be a major factor causing the degradation of the environment around us, affecting the water we use, the air we breathe and the soil we live on. The exponential increase in industrialization is not only consuming large areas of agriculture lands, but simultaneously causing serious environmental degradation as well as to soil. Present study on the effluent from Gayathri Sugars Pvt.Ltd. Were selected to study Sugar and alcohol manufacturing facility situated at Adloor yellareddy village, Sadashivanagar mandal of Nizamabad district T.S. The present investigation is focused on the effluents of Gayatri Sugars Pvt.Ltd the physico-chemical and biological parameters values viz., pH-5.21, Total dissolved Solids-2556.0 ppm, Chemical oxygen demand-3700 ppm, Biological oxygen demand-1126 ppm, Chlorides -497 ppm, Sulphates-422 ppm, Oil & Grease- 10.88 ppm, Electrical conductivity- 3760 μmhos/cm, Calcium-448 ppm, Magnesium- 155.52 ppm, Nitrates-28.4 ppm, Color- Brown & turbid, Lead-0.068 ppm, Copper-0.112 ppm, Zinc-0.32 ppm, Iron-28.8 ppm, Temperature-38 ^{0}C, Potassium-123.0 ppm. The Lake water is extensively used for major drinking, agriculture purposes. By discharging of industrial effluents without proper treatment causes to damage aquatic ecosystem as well as effecting on growth and development of crops.

Key words: *Toxicity, Industrial effluents, Physic-chemical parameters, Fresh water ecosystem.*

INTRODUCTION

Sugar industry is the backbone of rural, agricultural and socio - economic development in India[12]. There are nearly 436 sugar mills in India which play a major role in rural economy of our country. India is the second largest producer of sugarcane next to Brazil. Many industries are directly or indirectly dependent on sugar industry which in turn is responsible for overall development of state. Issues related to environmental pollution are becoming more serious with the increasing population, urbanization, industrialization and their indirect effects on ecosystem services[14,18]. In this context sugarcane production is of vital importance for its products and many by-products. During sugar production, the mills release a large amount of waste water containing various physical and quatic animals chemical agents.

They are discharged into land or nearby water bodie[4,7]. The polluted water is being used for irrigation by nearby farmers. It is necessary to study the impact of these effluents on crop system before they are recommended for agricultural irrigation. Disposal of industrial waste in rivers lakes without proper treatment is the major causes pollution of ground water as well as storage water bodies like ponds, lakes and reservoirs[15,20]. These water bodies become so contaminated by heavy metals also effecting on growth and development of aquatic life forms like hydrophytes, aquatic animals and also effecting human beings through food chain[3]. Due to presence of heavy metals, cosmetics and other valuable chemicals leading to the total degradation of water bodies[6,13,16,19]. Heavy metal such as nitrogen (N) and phosphorus (P), in the form of nitrate, nitrite, ammonia/ammonium or phosphorus in wastewater leads to eutrophication[11,20].

Simultaneously uncontrolled spread of certain aquatic macrophytes, oxygen depletion and loss of key floral and faunal species, leading to the total degradation of water bodies[9].Pollution stress simplifies a complex aquatic community by eliminating the more sensitive species[1]. The physical and chemical characteristics of water bodies affect the species composition, abundance, productivity and physiological conditions of aquatic organisms. Aquatic organisms and phytoplanktons is one of the most essential characteristics of the aquatic ecosystem for maintaining its stability and a means of coping with any environmental change[8]. Water maintains an ecological balance between various groups of living organisms and their environment[10]. The main objectives of the study were to physicochemical Parameters of sugar effluents collected from Gayathri Sugars Pvt. Ltd.

MATERIAL AND METHODS

Collection of sugar mill effluent: The raw effluent samples collected from the Gayatri Sugars Pvt. Ltd. during the study period March, 2014 to February, 2015. Samples were collected in sterile bottles during the crushing season. Collected samples analysed for physico-chemical parameters of 10 heavy metals COD, BOD, Total hardness of water, temperature and pH. As shown below table-1. The samples were analyzed for physicochemical and biological parameters using standard analytical procedures recommended by American Public Health Association (APHA) 1998.

Figure A: Over View of Gayatri Sugars Pvt. Ltd.

Figure B: Showing outflow of industrial wastage

Physico-chemical and Biological Characteristics of Sugar Mill Effluent:
Collected effluent samples were analyzed and determined on the basis of 18 important parameters *viz.*, pH, Total dissolved Solids, Chemical oxygen demand, Biological oxygen demand, Chlorides, Sulphates, Oil & Grease, Electrical conductivity, Calcium, Magnesium, Nitrates, Color, Lead , Copper, Zinc, Iron and Temperature. The average values of the samples at location for all the eighteen parameters are compared to the corresponding standard curves provided by the National Sanitation Foundation (NSF) Brown *et al.*[2] and a numerical value or "Q-value" is obtained. physicochemical and biological parameters of raw effluents of Factory effluent can be attributed to dissolution of various heavy metals during crushing period as shown bellow.

RESULTS AND DISCUSSION
Mean values of physicochemical and biological parameters of raw effluents of Factory effluent can be attributed to dissolution of various heavy metals during crushing period. All the parameters studied are within the permissible limits of Indian

Standards (IS:10500-2012). The different parameter pair is computed by taking the values of the Sugar effluent Calculated for parameters like water temperature, pH, total dissolved salts, electrical conductivity, turbidity, total hardness, total alkalinity, chloride, sulphate, nitrate, phosphate, dissolved oxygen, biological oxygen demand and chemical oxygen demand. Water temperature is found to show positive correlation with pH, total dissolved salts, electrical conductivity, total hardness, total alkalinity, phosphate and biological oxygen demand. Electrical conductivity showed a positive correlation with total hardness, total alkalinity, chloride and nitrate studded. The present our reports viz., pH-5.21, Total dissolved Solids-2556.0 ppm, Chemical oxygen demand-3700 ppm, Biological oxygen demand-1126 ppm, Chlorides -497 ppm, Sulphates -422 ppm, Oil & Grease- 10.88 ppm, Electrical conductivity- 3760 μmhos/cm, Calcium – 448 ppm, Magnesium- 155.52 ppm, Nitrates-28.4 ppm, Color- Brown & turbid, Lead-0.068 ppm, Copper- 0.112 ppm, Zinc-0.32 ppm, Iron-28.8 ppm, Temperature-38 ^{0}C, Potassium-123.0 ppm results are observed in Sugar effluents.

Table 1: Physicochemical and biological parameters of sugar effluents

S.N0	Test Parameters	Units	Results
1.	pH	--	5.21
2.	Total dissolved Solids	ppm	2556.0
3.	Chemical oxygen demand	ppm	3700
4.	Biological oxygen demand	ppm	1126
5.	Chlorides as Cl	ppm	497
6.	Sulphates as SO_4	ppm	422
7.	Oil & Grease	ppm	10.88
8.	Electrical conductivity	µmhos/cm	3760
9.	Calcium as Ca	ppm	448
10.	Magnesium as Mg	ppm	155.52
11.	Nitrates as NO_3	ppm	28.4
12.	Color	--	Brown & turbid
13.	Lead as Pb	ppm	0.068
14.	Copper as Cu	ppm	0.112
15.	Zinc as Zn	ppm	0.32
16.	Iron as Fe	ppm	28.8
17.	Temperature	^0C	38
18.	Potassium	ppm	123.0

CONCLUSIONS

Industrialization has led to unchecked proliferation of surrounding areas hazardous gases, possibilities of organic, inorganic pollutants, heavy metals and alcohols and sugar molasses viz., effluents on fresh water ecosystem, solid waste disposal effects on vegetation in the lake. Finally the article concluded that with results the high contaminated effluents without any proper treatment effects on aquatic life forms as well as on agriculture, soil pollution and causes ground water pollution.

Acknowledgement

REFERENCES

1. Akbay, N., Anul, N., Yerti, S., Soyupak, S. and Yurteri, C., Seasonal distribution of large phytoplankton in Keban dam reservoir. *Plank. Res.,* **21(4):** 771-787 (1999).
2. Brown, B. and Absanullah, M., Effects of heavy metals on mortality and growth. *Marine Pollution Bulletin,* **2:** 182-187 (2000).
3. Cossica, E.S., Tavares, C.R.G. and Ravagnani, T.M.K., "Bisorption of Chromium by Sargassium SP Biomas". *Electronic Journal of Biotechnology.* **5(2):** August issue (2000).
4. El-Sheekh M.M., El-Shouny, W.A., Osman, M.E.H., El-Gammal, E.W.E., Growth and heavy metals removal efficiency of Nostoc muscorum and Anabaena subcylindrica in sewage and industrial wastewater effluents. *Environ Toxicol Pharmacol* **19:** 357–365 (2005).
5. Gupta, S.K. and M.C. Pant. "Chemical Cmposition of surface sediments in Eutrophic lake. Naini Tal (up,India)". *Environmental Pollution.* *Series B* **6:** 95-107 (1983).
6. Gupta, V, Ratha, S.K., Sood, A, Chaudhary, V, Prasanna, R., New insights into the biodiversity and applications of cyanobacteria (blue–green algae)—prospects and challenges. *Algal Res* **2:** 79–97 (2013).
7. Ghosh, S., Barinova, S., Keshri, J.P. Diversity and seasonal variation of phytoplankton community in the Santragachi lake, West Bengal, India. *QSci Connect* **3:** doi:10.5339/connect (2012).

8. Jayaraman, P.R., Ganga Devi, T. and Vasudevan Nayar, T. Water quality studies on Karamana River, Thiruvananthapuram district, South Kerala. *Ind. Pollut. Res.* **22:** 89-100 (2003).

9. Khan, F.A., Ansari, A.A., Eutrophication: an ecological vision. *Bot Rev* **71:** 449–482 (2005).

10. Kumar, J. I., Oommen, C., *J Environ Biol.* **33:** (2012).

11. Liu, W., Zhang, Q., Liu, G., Lake eutrophication associated with geographic location, lake morphology and climate in China. *Hydrobiologia* **644:** 289–299 (2010).

12. Saranraj and Stella, D., Impact of Sugar Mill Effluent to Environment and Bioremediation: *A ReviewWorld Applied Sciences Journal* **30(3):** 299-316, (2014).

13. Pittman, J.K., Dean, A.P., Osundeko O. The potential of sustainable algal biofuel production using wastewater resources. *Bioresour Technol* **102:** 17–25 (2011).

14. Rawat, I., Kumar, R.R., Mutanda, T., Bux, F. Dual role of micro algae phycoremediation of domestic wastewater and biomass production for sustainable biofuels production. *Appl Energ* **88:** 3411–3424 (2011).

15. Renuka, N., Sood, A., Ratha, S.K., Prasanna, R., Ahluwalia, A.S., Nutrient sequestration, biomass production by microalgae and phytoremediation of sewage water. *Int J Phytoremed* **15:** 789–800 (2013).

16. Sahu, A.K., Siljudalen, J., Trydal, T., Rusten, B., Utilization of wastewater nutrients for microalgae growth for anaerobic digestion. *J Environ Manag* **122:** 113–120 (2013).

17. Singh, M., Reynolds, D.L., Das, K.C., Microalgal system for treatment of effluent from poultry litter anaerobic digestion. *Bioresour Technol* **102:** 10841–10848 (2011).

18. Sood, A., Uniyal, P.L., Prasanna, R., Ahluwalia A.S. Phytoremediation potential of aquatic macrophyte, *Azolla. Ambio* **41:** 122–137 (2012).

19. Spolaore, P., Joannis-Cassan, C., Duran, E., Isambert, A., Commercial applications of microalgae. *J. Biosci Bioeng* **101:** 87–97 (2006).

20. Yang, X., Wu, X., Hao, H., He, Z., Mechanisms and assessment of water eutrophication. *J Zhejiang Univ Sci B* **9:** 197–209 (2008).