



**ASSESSMENT THE NATURE OF THE LIQUID EFFLUENT DISCHARGED FROM
SUGAR INDUSTRY AND ITS SUITABILITY FOR LAND APPLICATIONS**

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ABSTRACT

The present investigation deals about the assessment the nature of liquid effluent from sugar mill and its applications to the crop plants. The liquid effluent treated from sugar industry has an alkaline pH (8.4) and the high value of BOD (447 mg /l) indicate that it effects the aerobic respiration of micro and macro organisms and hence it is not suitable for irrigation, drinking, and aqua culture purposes, even though sodium carbonate value is observed low. This is also indicated that the effluent from sugar industry is not suitable for irrigation purpose.

KEYWORDS: Sugar factory, effluent. Characterization, Application.

INTRODUCTION

CUBA is first largest producer of sugar and is generally called as sugar bowl of the world. India is the second largest producer of sugar and exports to various countries in the world. More than four hundred and fifty sugar mills are located in India. In Tamil nadu , forty one sugar mills , among this sixteen in co operative sector, three sugar mills in public sector and twenty two sugar mills in the private sector. At present 38 sugar mills are operational in condition. Sugar mill produces about 1500 liters of waste water per tone of cane crushed. The waste water coming from industries is commonly called as effluent. The effluent has a BOD (Biological Oxygen Demand) value ranging from 950 – 1450 mg / l. mostly effluent water is in black color due to contains many chemicals and has foul, odour. The untreated effluents from various industries are directly discharged in fresh water pods, pools and rivers. It plays a major role in water pollution. The discharged effluent cause decreasing the content of dissolved oxygen and increases the Biological and chemical oxygen demand of freshwater, make it unfit for aquatic life. Effluent also cause land pollution, make decaying of organic solids, oils, prevent the fertility of soil, block the pore between the soil particles. The present study deals with the characterization of sugar mill effluent and its applications to crops.

Maruthi *et al* (2001) was discussed about the effect of sugar mill effluent on organic reserves of fish. The physic chemical conditions of sugar mill effluent and their effect on quality and aquatic biota were studied by

Chowdary Abdullah *et al* (2000). Rajalakshmi *et al* (2014) reported the harmful quality of sugar mill effluent and its toxicity to crop plants. Poonam *et al* (2005) studied that the sugar mill effluent revealed that most of the parameters such as color, odour, total dissolved solids, COD, total alkalinity, pH, temperature, Phosphate and sulphate concentration have exceed ISI limits.

MATERIALS AND METHODS

Sugar mil

Effluent was collected from E.I.D. Parry Sugar Mill, Kurumbur, Pudukkottai District. This sugar mill is located fifteen kilometers from Pudukkottai city. The sample of effluent water (before and after treatment) was collected and preserved in black bottles for further analysis.

Physico – chemical parameter

Fifteen physic – chemical parameters were carried out using the sample. these parameters include pH, Total dissolved solid (TDS), Total suspended solids (TSS), Biological oxygen demand, Chemical oxygen demand, Hardness, Calcium hardness, Magnesium hardness, chlorine ion concentration, phosphate ion concentration, sulphate ion concentration, dissolved oxygen, Electrical conductivity, Residual sodium carbonate (RSC), etc. Standard analytical methods for physic chemical analysis of water of Ramteke and Moghe (1998) were followed for this research work.

Characterization of intake water

E.I.D. parry Sugar mill adopted various characterization method to intake water. So that the quality of water

employed by the industry can be estimated and it is analysed for various parameters and the results were tabulated in Table I

Table I: Characterization of intake water.

S. No.	Lists of Parameters	Observed values
1	pH	8.4
2	Total dissolved Solids	214 ppm
3	Total suspended solids (TSS)	46 mg / l
4	Biological oxygen demand	3.5 mg / l
5	Chemical oxygen demand	19 mg / l
6	Hardness	127 mg / l
7	Calcium hardness	83.5 mg / l
8	Magnesium hardness	41.9 mg / l
9	chlorine ion concentration	31.7 ppm
10	phosphate ion concentration	0.142 ppm
11	sulphate ion concentration	2.3 ppm
12	Fluoride ion concentration	0.372 ppm
13	dissolved oxygen	5.9 mg / l
14	Electrical conductivity	269 umhos / cm
15	Residual sodium carbonate (RSC)	BDL mg / l

Table II: Water classification for irrigation purposes.

Class of water	TDS (ppm)	Chloride (ppm)	Sulphate (ppm)	Suitability for irrigation
I	0 - 700	0 - 142	0 - 192	Good for irrigation
II	700 - 2000	142 - 350	192 - 480	Suitable only with permeable soil
III	>2000	>350	>480	Unfit for irrigation

Characterization of Liquid effluent

Effluent from sugar industry play a major role in pollution, there is significance in characterizing the

Liquid effluent generated from the Effluent treatment Plat (ETP) of the industry. The analytical data carried out by industry is presented in Table - 3.

Table - III: Data ETP.

S. No.	Parameters	Standards		Observed value	
		Irrigation	Aqua culture	Before treatment	After treatment
1	pH	5.0 - 9.0	5.0 - 9.0	5.4	8.4
2	TDS	0 - >2000	2100	3300	1650
3	TSS	200	100	320	80
4	BOD	100	30	1600	450
5	COD	-	250	770	130
6	Hardness			1048	750
7	Calcium hardness			384	304
8	Magnesium hardness			664	446
9	chlorine		-	49.9	24.9
10	phosphate		5.0	0.865	0.59
11	sulphate	0 - >480	-	50.9	14.8
12	Fluoride	-	2.0	13.6	0.206
13	Dissolved oxygen	-	50	BDL	BDL
14	Electrical conductivity		-	2500	2100
15	Total solids			3650	1700

*BDL - Below Detectable Limit

RESULTS AND DISCUSSION

Various physic chemical parameter such as parameters include pH, Total dissolved solid (TDS), Total suspended solids (TSS), Biological oxygen demand, Chemical oxygen demand, Hardness, Calcium hardness,

Magnesium hardness, chlorine ion concentration, phosphate ion concentration, Sulphate ion concentration, dissolved oxygen, Electrical conductivity, Residual sodium carbonate (RSC) were carried out as per CPCB (1995) and IS: 3025 - 1964 procedures.

The pH value of the liquid effluent after treatment is considerable. The value of electrical conductivity of the effluent is high (2100 μ mhos / cm). Both these values indicated that the sugar mill effluent is so harmful to sensitive crops. The TDS value (1650 ppm) for the treated effluent is more while the value of total suspended solids for the effluent after treatment is considerable. The parameters such as Chloride, Sulphate, Phosphate and fluoride concentration values are within the permissible limits. The chemical oxygen demand also coming within permissible limits. The DO (Dissolved oxygen) value is at below detectable limit. All the results obtained from this investigation indicates that it effects the aerobic respiration of organisms and hence it is not suitable for irrigation and aquatic life according to Poole *et al* (1978). The value of Biological oxygen demand value (450 mg / l) for the liquid effluent after treatment is very high indicating the load of organic pollution. The results indicate that the effluent is not suitable for irrigation as well as for aquaculture purposes.

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