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PHYSICO-CHEMICAL ANALYSIS OF SUGAR INDUSTRY EFFLUENTS OF GAYATHRI SUGAR FACTORY NIZAMABAD DISTRICT, TELANGANA STATE

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ABSTRACT

Present work is based on the physico – chemical analysis of effluents released from gayathriSugarFactory. Sugar mills place a major rolling polluting the water bodies by discharging a large amount of waste water as effluent. The sugar mill effluent are having high amount of Suspended solids, dissolvesolids, BOD,COD, Chlorides, Sulphates, Nitrates, Calcium and Magnesium. The Continuous use of the Effluents harmfully affects the crops when used for Irrigation. It was found that the sugar industries consume large amount of water and released almost equal amount effluent containing highly toxic material in solid and dissolve form. Sugar Factory effluents was more worst like Average values of lower PH (6.2), high temperature (42◦c),chloride (862mg/ lit), total hardness (571mg/lit), calcium (362 mg/Lit), Magnesium (211 mg/Lit), total solids (2452 mg /Lit),Total Dissolved solids (1915 mg/Lit), Total Suspended Solids (542 mg/Lit), Nitrate (0.8 Mg/Lit), Phosphate (9.8mg/Lit), Sulphate (49.3 mg/Lit) and Oil & Grees (87.8 mg/Lit). And finally this water is Unsafe for domestic and agriculture purposes. Therefore it should be recycled and utilized for Industrial purpose only.

KEY WORDS: Gayathri Sugar Factory, Sugar Factory Effluents, Physico - Chemical Analysis.

INTRODUCTION

Sugar mills play a major role in polluting the water, land and air. Commonly the pollutants are through effluents and hazardous chemicals in the form of air [1]. Sugar industry plays an important role in the economic development, but the effluents released will produce a high organic pollution in both aquatic and terrestrial and air ecosystems [2]. Metals and non-metallic elements can be useful for the agricultural seed germination and growth, but in high concentration they show a very adverse effect [3]. Effluents also affect characteristics like flora and fauna of receiving aquatic bodies, effluent discharged in the environment poses a serious health hazard to the rural and semi-urban populations that use stream and river water for agriculture and domestic purposes. Damage to paddy crops due to sugar industry waste-waters entering agricultural land have been reported [4]. It had been reported that the lowerconcentration of sugar factory effluent increases the seedling growth [5&6]. As sugar factory effluent not treated properly, it will have an unpleasant odor when it is released into environment [7].Farmers using effluents water for irrigation to reduce water demand havefound that plant growth and crop yield were reduced and soil contaminated[8]. This is also causing deaths of domicile animals of such polluted water have beenreported increasingly [9].

MATERIALS & METHODS

The effluents from Gayathri sugar factory was collected during the beginning of rainy season **(2013 July -2014 June)** in the glass bottles from the discharge channel and properly sealed. It was preserved by adding chemicals to analyze in the laboratory, for the assessment of various physico-chemical characteristics a standardized protocol of APHA [10] was used.

RESULTS & DISSCUSSION

Color

As per the present study, the color of untreated effluent was dark brownish. The photosynthesis activity is found to be reduced due to dark coloration also affecting other parameters like temperature DO and BOD etc.

Temperature

Temperature plays an important role in certain chemical and biological reactions taking place in water which affects organism's metabolic activity. It depends upon season, time sampling etc. The effluent which had been released from the industry has generally high temperature and it affects land. The temperature of untreated effluent was recorded 43°C. The temperature

of the discharge should not exceed 35°C. The high tem i.e. 43°C of the untreated effluent has adversely affected the process.

pH

In the present study, pH values of treated and untreated are 5.8 and 6.2 respectively. According BIS standards pH of the effluents should be in the range of 6.5 to 8.0. These low pH values of both treated and untreated samples are due to usage of phosphoric acid and Sulfur dioxide during the process of cleaning of sugar cane juice. If such water is used for irrigation for a longer period the soil becomes acidic resulting in poor crops growth and yield.

Dissolved Oxygen

The analysis of Dissolved Oxygen (DO) is one of the very important factors in water pollution and waste water control. Aquatic ecosystem totally depends on DO only. It effects the metabolic activities of microorganism were very well documented. According to the BIS standards, the DO of effluent should be within the range 4 to 6 mg/lit. In the present study, DO of the untreated effluent sample was recorded 1.16 and 2.23g/lit respectively which is sufficiently low than the BIS Indian standard values.

BOD

Biochemical Oxygen Demand (BOD) is defined as amount of oxygen required by microorganism while stabilizing biological decomposable organic matter in water under aerobic conditions. The BO is a very slow process in oxidation; organic pollutants are oxidized by microorganisms into carbon dioxide, water using dissolved Oxygen. In the present study, the BOD of the untreated effluent was 86mg/lit. According to BIS Indian standard the BOD should not exceed the 50 mg/l.

COD

The chemical Oxygen demand test describes the amount of oxygen required for chemical oxidation of organic matter with the help of strong chemical oxidant. The COD is a test which is used to measure the amount or quantity of pollution which has been released by domestic and industrial waste. COD is useful todetermine the exact toxic condition and presence of biological matters. In the present study, the COD of the untreated effluents was 460 mg/l. In untreated effluent it is appreciably high compared to BIS standard (250 mg/L). This indicates a high amount of organic pollutants in the sample.

TDS

The total dissolved solids concentration in the effluent represent the colloidal form and dissolved specters. The rate of collision aggregated process is also influenced by pH ofthis effluent. In the rainy season less concentration of total dissolved solids are obtained due to dilution of waste effluent with rain water. In the present study, the total solids in untreated effluent were 1958 mg/lit. The samples in TDS values are much higher compared to BIS Indian Standards (500 mg/L).

TSS

Suspended solids are the cause of suspended particle inside the water body influencing turbidity. According the present study, the suspended solids of untreated effluent were542mg/l

Chlorides

The presence of chloride in natural water is attributed to dissolution of salt deposit, discharge of effluents from chemical industries oil well operations. In the present study chlorides of untreated was 862 mg/l.

Sulphate

Sulphate can also be produced an oxidizing action as in the oxidation action. Sulphur itself has never been limiting factor in aquatic system. In the present study,sulphate in untreated effluent was 493 mg/l according BIS Indian standard, thesulphate should not exceed 100 mg/l.

Oil and grease

In the present study, oil and grease present in un-treated effluent showed 87.8mg/l oil and grease values are higher than BIS standards.

Table : 1 Seasonal variation in the Physico- Chemical parameters of the un-treated sugar factory effluents (during period of 2013 July -2014 June)

S.No	Parameter	Rainy	Winter	Summer
1	temperature	42˚C	41˚C	43˚C
2	pH	6.8	5.8	5.2
3	DO	1.30 mg/lit	1.76 mg/lit	2.4 mg/lit
4	BOD	98 mg/lit	92 mg/lit	94.3 mg/lit
5	COD	35.0 mg/lit	270 mg/lit	250 mg/lit
6	TDS	1915 mg/lit	1870 mg/lit	1860 mg/lit

7	TS	2452 mg/lit	2318 mg/lit	2541 mg/lit
8	TSS	542 mg/lit	662 mg/lit	654 mg/lit
9	Chlorides	852 mg/lit	896 mg/lit	786 mg/lit
10	Sulphates	493 mg/lit	398 mg/lit	410 mg/lit
11	Oil & grease	67.8 mg/lit	76 mg/lit	87.8 mg/lit

Table: 2 The Physico-chemical parameters of untreated sugar mill effluent

S.N0	Parameter	Untreated Effluent	BIS standards
1	Temperature	43	40
2	pH	6.2	6.5-9.0
3	DO	1.30 mg/lit	4-6 mg/lit
4	BOD	98 mg/lit	50 mg/lit
5	COD	350 mg/lit	250 mg/lit
6	TDS	2915 mg/lit	2100 mg/lit
7	TS	2452 mg/lit	2700 mg/lit
8	TSS	542 mg/lit	600 mg/lit
9	Chlorides	862 mg/lit	600 mg/lit
10	Sulphates	493 mg/lit	200 mg/lit
11	Oil & grease	87.8 mg/lit	10 mg/lit

CONCLUSION

The Gayathri sugar industry situated at Nizamabad district, Telangana State is one of the good factories. It has own distillery unit in its own premises for waste which is generated from the sugar factory. The sugar industry needs modification in effluent treatment. Thus the sugar industry effluent which is untreated exhibits high COD, BOD, and TDS content. And low content of DO which is toxic to plants and animals, so it is not permissible for irrigation. The sugar industry effluent is highly polluted and they do not satisfy the BIS Indian standard values

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