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Research Paper

Comparative Account of Untreated and Treated Sago Effluent Analysis by Investigating Different Physical and Chemical Parameters

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Abstract: *With the rapid growth of industries, pollution in natural waters by industrial wastes has increased tremendously. Due to lack of treatment and improper modes of disposal of wastes, the water bodies are polluted and they carry deadly substances. The present work aims at studying the nature of untreated and treated sago effluent to make a comparison of the quality of effluent water that are discharged into the water system. The untreated and treated sago effluent samples were collected from the factory and the physico-chemical parameters were analyzed. The results were compared with ISI standard. The results are tabulated and conclusions are drawn.*

Keywords: Sago effluent, Analysis, Physico-Chemical parameter, water samples.

Introduction

Industrialization is linked to economic growth and human prosperity. But at the same time increased industrialization leads to deterioration of environmental quality and subsequently detrimental health of man and animals as well. The rapid unplanned industrial progress has added to the problem of pollution. Industrial pollutants are known to bring changes in the abiotic and biotic components of the ecosystem. Sago and starch production from tapioca root crop is one of the major food industries in South-east Asia. There are nearly about 1000 sago and starch processing factories operation in Salem and Namakkal District of Tamil Nadu, India. These sago industries release large amount of waste

water containing organic and inorganic solid wastes. This waste water commonly referred as effluent which has obnoxious odour, irritating colour, lower pH, higher BOD and COD. It affects the health of the soil, natural ecosystem, animals, plants and human beings [6, 1, and 5]. The tapioca tubers are the raw materials and it is converted in to commercial sago through indigenous technology that requires large amount of water. During this process, these units release about 45,000 to 50,000 liters of sago effluent and takes about 10 days for water to be let out of the factory as effluent [2,6, and 7].Effluent generated by the sago industries are highly toxic when it is released in to the environment without proper treatment, it alters the characteristics of ecosystem[3,4]. Hence in the present study an attempt is made to study the comparative account of untreated and treated sago effluent by investigating the physical and chemical properties.

Materials and Methods

The treated and untreated Sago industry effluents were collected from a private Sago industry, situated at Poonachi near Ammapet of Erode District, Tamil Nadu. The effluent from the industry was collected in plastic containers from the outlet of the factory and transported to the laboratory. The collected untreated and treated sago effluents were analyzed by the standard method [8].

Results

The collected untreated and treated sago industry effluents were analyzed in the laboratory to determine the different parameters present in them. The physiochemical parameters like pH, Total Suspended Solids, Total Dissolved Solids, Biological Oxygen demand, Chemical Oxygen Demand, Dissolved Oxygen, Sulphates, Oil and Grease, Chlorides, Total Residual Chlorine, Calcium, Magnesium and Hardness were analyzed for untreated and treated sago effluents by standard method [8]. The results are presented in Table 1.

Table 1: Physic – Chemical Analysis of Untreated and Treated Sago Effluents

S. No	Parameters	Untreated Sago Effluent	Treated Sago Effluent
1.	pH	4.16	7.82
2.	Total Suspended Solids (TSS)	460 mg/L	186 mg/L
3.	Total Dissolved Solids (TDS)	1984 mg/L	2050 mg/L
4.	Biological Oxygen Demand (BOD)	4200 mg/L	340 mg/L
5.	Chemical Oxygen Demand (COD)	5120 mg/L	448 mg/L
6.	Dissolved Oxygen (DO)	0.07 mg/L	0.32 mg/L
7.	Sulphates	86 mg/L	384 mg/L
8.	Chlorides	716 mg/L	630 mg/L

9.	Calcium	140 mg/L	80 mg/L
10.	Magnesium	46 mg/L	16 mg/L

Discussion

Cassava sago industry is an increasingly important agro-based industry. Cassava starch is a major raw material in food, textile and pharmaceutical industries. Cassava tubers contain about 20-30% starch which is distributed in the cellulose matrix.

Extraction of starch from Cassava consists of washing of tubers, mechanical peeling, rasping, grinding, sieving, regrinding, and dewatering. The recovery of starch from tubers is not complete; some amount of starch along with fibrous wastes is discharged as residues. The waste water coming out of the settling tanks contain unextracted starch, cellulose, carbohydrates, nitrogenous compounds and cyanoglucosides. It has been customary to discharge the effluents from the factory to rivers, lakes, ponds, drainage channels and fields.

The effluents have a high BOD, COD, cyanide content and pose serious threat to environment. The ground water sources near the factories are also polluted with the cyanoglucosides. The untreated waste water causes damage to crop growth which is grown near to factories.

In the present study wide variations of physical and chemical constituents of untreated and treated effluents obtained from cassava sago starch factory. Wuhrman and Woker had reported that the physico-chemical features of water have significant influence on the biodegradability and toxicity of pollutants [9]. The cyanide though denatured slowly, when discharged continuously is detrimental to the environment.

The following table summarizes some of the ISI guidelines for common water quality constituents.

Table 2: ISI permissible limit for water quality

S. No	**Characteristics of concern**	**Standard Level**
1.	pH	5.5 – 9.0
2.	Total Dissolved Solids (TDS)	2100 mg/L
3.	Total Suspended Solids (TSS)	100 mg/L
4.	Biological Oxygen Demand (BOD)	100 mg/L
5.	Chemical Oxygen Demand (COD)	250 mg/L
6.	Dissolved Oxygen (DO)	4-6 mg/L
7.	Chlorides	1000 mg/L
8.	Sulphates	1000 mg/L
9.	Calcium	75 mg/L

When compared to the untreated effluent, treated effluent is less toxic, because the integrated treatment system for effluent following anaerobiosis and aeration reduces the pollution load. The waste water generated by most agro based industries is organic in nature and anaerobic digestion is the way to combat pollution.

In the present investigation pH (7.82), Total Dissolved Solids (2050 mg/L), Sulphates (384 mg/L), Chlorides (630 mg/L) and Calcium (75 mg/L) of treated effluent are under the standard level, which is presented by ISI. Hence, they may not cause any harm to the fishes.

Biological Oxygen Demand (340 mg/L) and Chemical Oxygen Demand (448 mg/l) are slightly higher than the standard level. Almost 80%-87% reduction on the COD is achieved by bioreactor. It is suggested that the proper dilution can reduce the pollution load. Hence the treated sago factory effluent can be taken into consideration and the possibility of using this effluent for aquaculture.

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