

PHYSICO CHEMICAL CHARACTERIZATION OF UNTREATED AND ANAEROBICALLY TREATED DISTILLERY EFFLUENT

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Key Words : Distillery effluent, treated, pollution.

ABSTRACT

In the present study the physico-chemical parameters such as color, odor, pH, EC, total solids, Total dissolved solids, Suspended solids, Sulphates, Phosphate, Nitrate, potassium, Sodium, DO, BOD and COD were analysed. The effluent was acidic and dark brown in colour. The conductivity was found to be higher. The analysis was carried out for three months.

INTRODUCTION

Distillery is an ancillary unit of sugar industry and uses cane molasses as raw material, which is a by product of sugarcane manufacturing. The distillery waste in large volume have a very high pollution potential due to the presence of large quantity of organic matters (Kaul *et. al.* 1993). All India Distilleries Association: has listed 212 distilleries which have an annual production of about 6500 million lit. of alcohol. Maximum number of distilleries are located in Maharashtra followed by Uttarparadesh (Srivastava and Pathak 1998).

Molasses based distilleries generate an average of 15 lit of wastewater called spent wash per litre of alcohol produced. This wastewater is characterized by high organic matter and dissolved solids, BOD, COD, low pH and dark brown color with a foul smell . (Nanjundaswamy *et. al.*, 1998).

Because of the higher BOD and COD values distillery effluent create toxic conditions in the receiving stream by immediate depletion of oxygen. Its disposal results in massive destruction of aquatic flora and fauna and discoloration of streams. The offensive odour spreads over a few kilometer and

results in serious public health hazard. Hence it becomes advisable to opt for safe and effective means of effluent treatment both as a practical necessity and as a social responsibility. (Vaidyanathan *et. al.*, 1995).

Discharge of effluents into fresh water streams deplete the DO content and causes higher mortality by interfering with respiratory metabolism (Venkataraman, 1965).

MATERIALS AND METHODS

Collection of Samples

Samples were collected by using polyethylene container. Prior to the collection, the sampler was rinsed thoroughly with the sample water even if it is precleaned.

Sample Handling

Immediately after collection, each sample was labeled with water proof ink, details for each sample was recorded.

Temperature and pH of water was immediately recorded.

The samples were taken to the laboratory as early as possible. They were protected from direct sunlight during transportation.

Physico-chemical characterization of the distillery effluent

The pH, electrical conductivity, total solids (TS), total dissolved solids (TDS), total suspended solids (TSS), Sodium, Potassium, Nitrate, Biological oxygen demand (BOD), chemical oxygen demand (COD) were measured as per standard method APHA (1989).

Colour

The colour of the effluent was found out visually.

Odour

The odour was found to be alcoholic which was unacceptable in nature.

RESULTS

Colour, odour, pH, EC, total solids, total dissolved solids, total suspended solids, sulphates, phosphates, nitrate, potassium, sodium, DO, BOD and COD were determined and tabulated in Table- 1.

All the samples have high amount of TS, TDS, and TSS.

DISCUSSION

Physical characteristics of the distillery effluents

Colour of all the samples were dark brown in colour. The colour is suspected due to the presence of a derivative of caramelized sugar, formed during the distillation, termed as melanoiodin (Ramchandra and Pandey, 2000).

Odour of all samples was alcoholic in nature, The pH was found to be around 5 for untreated and 6.8 for treated sample. Similar result was reported by Nemade and Shrivastava (1996) (a) and they have reported that the distillery effluent is acidic in nature and thus affects the plant growth.

All the samples have high amount of solids, hence the Electrical conductivity of all samples were high.

Chemical characteristics of the distillery effluents

Nitrate of all the samples were found to be in the range of 1250 mg/L to 3500 mg/L.

Sodium and Potassium of treated and untreated samples were found to vary from 10000-16000 mg/L, 13500-17100 mg/L respectively. These ions percolate through the soil strata and contaminate the underground water. The higher concentration has been reported to result in cardiovascular disease and women toxemia associated with pregnancy. The high concentration of Sodium in irrigation water is of considerable interest. Such water when used for irrigation will increase the exchangeable sodium content of the soil. This affects the soil permeability and texture and leads to puddling and reduced rate of water intake. These type of soils become hard to plough and unfit for seedling emergence. These conditions are not conducive to normal plant growth. Potassium has a similar chemistry like Na. As such, it is not very much significant from the health point of view but large quantities may be laxative (Nemade and Shrivastava 1996 (b)).

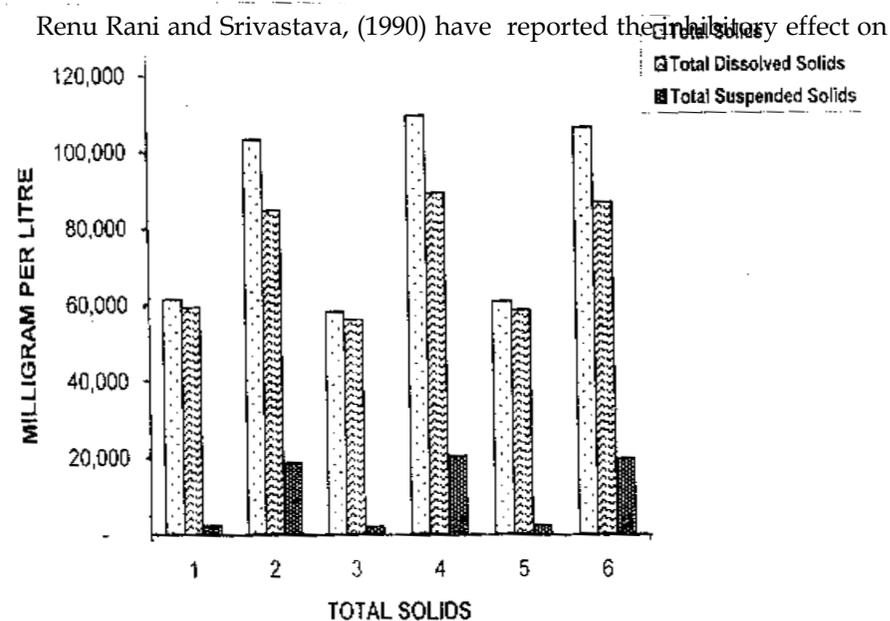


Fig. 1 - Total solids present in distillery effluent

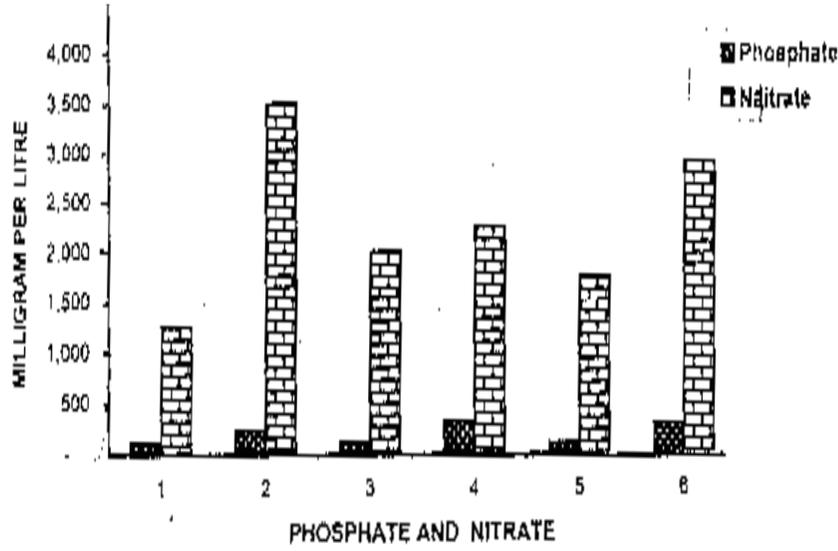


Fig. 2 - Phosphate and nitrate present in distillery effluent

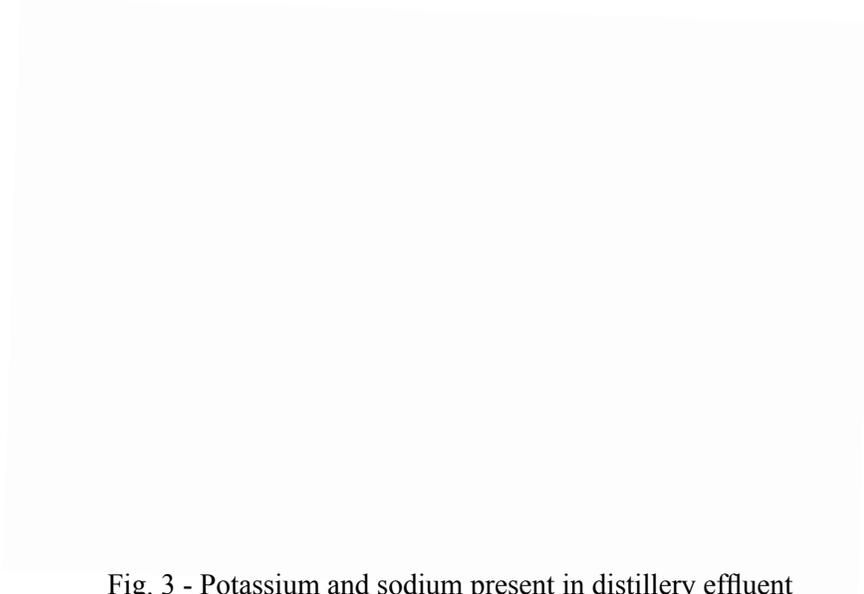


Fig. 3 - Potassium and sodium present in distillery effluent

TABLE - 1
Physico chemical characteristics of treated and untreated distillery effluent

Parameters	December		January		February	
	Treated (1)	Untreated (2)	Treated (3)	Untreated(4)	Treated(5)	Untreated (6)
pH	7	5.6	6.8	5.7	7	5.6
Electrical Conductivity	68,000	82,000	74,000	79,000	72,000	78,000
Total Solids(mg/L)	61,480	103,210	58,133	1,09,470	60,806	1,06,380
Total Dissolved Solids (mg/L)	59,285	84,610	56,120	89,160	58,560	86,736
Total Suspended Solids (mg/L)	2,195	18,600	2,013	20,310	2,246	19,644
Sulphates (mg/L)	5,320	13,300	3,990	7,980	4,290	9,320
Phosphates (mg/l)	108	228	108	312	102	276
Nitrate(mg/l)	1,250	3,500	2,000	2,250	1,740	2,900
Potassium (mg/L)	14,100	17,100	13,500	16,400	13,700	16,800
Sodium (mg/l)	11,000	16,000	10,000	14,000	10,000	15,000
DO (mg/l)	4	2	4.5	2	5	2.5
BOD (mg/L)	32,100	51,000	31,050	50,450	29,050	49,000
COD (mg/l)	78,560	90,500	76,650	90,450	70,510	90,000

Citrus maxima at higher concentration. The excess of Nitrogen, Phosphate, Potassium, Calcium, Chloride and Sulphate were found to be injurious to plant growth. Since they affect the water absorption indirectly and other metabolic processes in the plants.

The DO was found to be 2 mg/L. Hence the BOD and COD was higher which is due to the presence of organic matter which have added up due to the processes involved.

Thus the present study reveals that the treatment of the distillery effluent is essential for the safer disposal of the distillery effluent. But the treatment technology practiced is found to be inefficient. However it could be made further efficient to achieve better results thereby facilitating the recycle of the effluent possible. (As per the insudtry sources).

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