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Physico Chemical Parameters and Identification of Bacteria in Paint Effluent

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Abstract: Physico chemical parameters of untreated paint effluent and identification of bacteria present in the effluent were studied. The results of analysis of parameters revealed the BOD, COD, EC, TDS TSS, were recorded to be high than the standard limits for disposal. 2 species of bacteria were isolated and identified from the paint industry.

Keywords: Untreated Paint Effluent, Physico Chemical Parameters, Identification Of Bacteria.

I. INTRODUCTION

Paint industry is one the industry the causes the water pollution. Wastewater is generated primarily due to cleaning operations of mixers, reactors, blenders, packing machines and floors. (Aboulhassan et al., 2014). The effluent has high organic and inorganic toxic pollutants. The discharge of such wastewater with high pollutants into the environment damage the quality of water bodies and also affect food chain hence it is essential to treat the wastewater before its disposal. Scientists are presently concentrating on the isolation of certain organism and its degrading capacity of organic and inorganic compounds and also metals used in various industrial processes (Krishna Priya, 2010). Based on the investigations carried out by the researchers pertaining to isolation of microbes from various industrial effluents, an attempt has been made to analyse the physicochemical parameters and identification of microbes from untreated paint effluent .

II. MATERIALS AND METHODS

Untreated paint effluent was used as the material in this study. The untreated sample was collected from paint industry situated in Chennai, Tamil Nadu, India, in polythene containers (5 litres capacity). They were brought to the laboratory with due care and stored at 25°C for further analysis. The samples were collected for a period of 3 months from December 2014 – February 2015. The physico-chemical parameters such as Colour, Odour, pH, Electrical Conductivity (EC), Total Suspended Solids (TSS), Total Dissolved Solids (TDS), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD) of untreated paint effluent were determined by following the Standard Methods outlined by APHA (1995). Untreated paint effluent for Isolation of microbes (Bacteria) Paint effluent of about 1 litre was collected in sterile bottles and brought to the laboratory. Analysis of microbes (bacteria) was carried out on the same day. Untreated paint effluent was diluted to 10-1 using sterile distilled water. 1 ml of the diluted sample was cultured on Nutrient Agar Medium (NA) following pour plate method. The cultured Petri plates were incubated at 37°C for 24 to 48 hrs and after the incubation period, the species developed on the medium were observed, identified and confirmed by carrying out the biochemical tests (Powar and Daginwala, 1995).

III. RESULTS AND DISCUSSIONS

Results of the analysis of physico-chemical parameters of untreated paint effluent collected for a period of 3 months (December 2014 to February 2015) are depicted in Table 1. The results of the study revealed that the colour of the untreated paint effluent is blackish in colour and odour of untreated paint effluent has foul smell which may be due to presence of large quantity of organic and inorganic pollutants (Singh et al., 1998) or may also be due to microbial activities (Nagarajan and Shasikumar, 2002 and Jerin, 2011). The pH of untreated paint effluent has a minimum range of 6.60 (December 2014) and a maximum range of 7.02 (January 2015), thereby indicating the alkaline nature of the paint effluent. The conductivity of the untreated paint effluent ranges between 3500 µmhos/cm (January 2015) and 3830 µmhos/cm (December 2014) and the values of EC are higher than the permissible limits (400 µmhos/cm) of CPCB (1995).TSS level of untreated paint effluent ranges from 12.3 mg/1 (January 2015) to 14.6 mg/l (December 2014) indicating that the values of TSS is higher than the permissible limit (100 mg/l) prescribed by CPCB (1995) which may be due to presence of large amounts of salts in the effluent . This is supported by the work of Soha Farag and Sohar Zaki (2010). TDS of untreated paint effluent ranges between 2450 mg/l (January 2015) and 2681 mg/l (December 2014) and the values of TDS are higher than permissible limits (2100 mg/l) of CPCB (1995). This is in agreement with the work of Noorjahan, et al., (2004).

BOD levels of untreated paint effluent has a minimum value of 90 mg/l (December 2014) and maximum value of 180 mg/l (February 2015) which are higher than the permissible limit (30 mg/l) of CPCB (1995). COD of untreated paint effluent ranges between 265 mg/l (December 2014) and 560 mg/l (February 2015) and the values of the

COD of untreated sample are beyond the permissible limit (250 mg/l) of CPCB (1995). This may be due to the presence of large amount of toxic substances present in the effluent (Jerin, 2011). Chromium levels of untreated paint effluent ranges between 0.008 mg/l (February 2015) and 0.014 mg / l (December 2014) and the values are within the permissible level (3 mg / l) of CPCB (1995). Copper levels of untreated paint effluent ranges between 0.00176 mg/l (January 2015) and 0.00271 mg/l (February, 2015) and the values are within the permissible level (1.5 mg/l) of CPCB (1995) which is supported by the work of Noorjahan, et al.,(2004).

A. Isolation and Identification of microbes (bacteria) from untreated paint effluent:

Microbes especially bacteria act as bio indicator of high polluted effluents as reported by Soha Farag and Sahar Zaki (2010), which prompted to analyse the native bacterial population in paint effluent and to use it for biodegradation. Bacterial analysis of paint effluent using gram staining technique gave violet colour confirmed the presence of gram positive cocci and gram negative bacilli (Table – 2 and 3). Gram positive cocci are further subjected to biochemical tests. Indole test gave positive result showed the absence of tryptophan. Positive result was obtained for Methyl Red test. Negative result was obtained for voges - proskauer test and showed the absence of acetoin. Negative result for citrate utilization that was due to the inability of bacteria to ferment citrate. Positive result for coagulase test confirmed the presence of gram positive cocci, Staphylococcus aureus in untreated paint effluent. Whereas gram negative bacilli showed positive results for methyl red test, indole test and EMBA test. Hence the above results confirmed the presence of gram negative bacilli, Escherichia coli and gram positive Staphylococcus aureus which were identified in the untreated paint effluent.

TABLE I: Physico Chemical Parameters of Untreated Paint Effluent Collected for a Period of 3 Months from December 2014 - February 2015

S.No.	Parameters	CPCB (1995)	December 2014	January 2015	February 2015
			Untreated	Untreated	Untreated
1.	Colour	Colourless	Blackish	Blackish	Blackish
2.	Odour	Odourless	Foulsmell	Foulsmell	Foulsmell
3.	pH	5.5-9.0	6.60	7.02	6.88
4.	Electrical Conductivity (µmhos/cm)	400	3830	3500	3580
5.	Total Suspended Solids (mg/l)	100	14.6	12.3	13.8
6.	Total Dissolved Solids (mg/l)	2100	2681	2450	2506
7.	Biochemical Oxygen Demand (mg /l)	30	90	140	180
8.	Chemical Oxygen Demand (mg/l)	250	265	512	560
9.	Chromium (mg / l)	3	0.014	0.014	0.008
10.	Copper (mg / l)	1.5	0.00251	0.00176	0.00271

TABLE II: Isolation and Identification of Bacteria From Untreated Paint Effluent

Medium	Bacteria
Nutrient Agar	Escherichia coli (gram positive)
	Staphylococcus aureus (gram positive)

TABLE III: Biochemical Tests of Bacterial Culture Isolated From Untreated Paint Effluent

Sample	Organism	Gram Staining	Methyl Red	Voges-Proskauer Test	Citrate Utilisation Test	Indole Test	Motility	Special Test
Untreated paint effluent	Escherichia coli	Positive Cocci	Positive	Negative	Negative	Positive	Non-motile	Coagulase Test
	Staphylococcus aureus	Negative Bacilli	Positive	Negative	Negative	Positive	Motile	EMBA Test

Paint effluent is rich in organic and inorganic nutrients which would have supported the growth of bacterial population. Soha Farag and Sahar Zaki (2010) identified 9 bacterial species in tannery effluent. 2 species of bacteria were identified in flavour effluent as reported by Jerin (2011). The presence of 2 bacterial species in the paint effluent as reported in the present study has significance in their utility as biological indicators (Rao and Rao, 2000). Further as pointed out by Radha (1995), the presence of native microbes in paint effluent would be successfully exploited to remove the pollutants, a technique which is more economically and industrially effective. Thus it can be concluded from the above study that the untreated paint effluent has high level of inorganic and organic toxic pollutants which has supported the growth of bacterial population in the effluent as evidenced in the above study. So the effluent has to be treated before its disposal.

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