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ALGAL FLORA OF ALCOHAL DISTILLERY EFFLUENT

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INTRODUCTION

The rate of contamination of natural water bodies increases with increased human activities in the industrial area. The wastes of such activities are finally discharged into the natural water courses resulting in the undesired eutrophication. Purdy and Butcher (1937) were among the earliest to record algal communities causing varying degree of pollution. Patrick (1948) stressed the importance of biological indicators on the assessment of water quality over the years. A number of systems have been evolved to asses the pollution of fresh waters. Brick (1963), Sladecek (1973); Fjerdingstad (1950); Dresscher and Vander Mark (1976), Sreenivasan *et al.,* (1980) have reported some fauna and flora as indicative of pollution. In the present investigation attempt were made to correlae the distribution and periodicity of algae in the desired polluted area with chemical picture of polluted water, discharged from distillery.

MATERIALS AND METHODS

The distillery is situated approximately 3 km away from Unnao city towards west of Kanpur-Lucknow railway line. The effluent of factory are discharged into an open drain which joins one of the nearby fresh waterh channels. Standard methods for the examination of effluent (APHA, 1976) were followed in the analytical techniques. A regular monthly sampling of effluent with simultaneous collections of algae were conducted.

Collection of Water and Algal Samples.

Spots were selected for collecting samples. Sampling was done from four or five sites in each spot. The water samples were collected at 30 days interval from the spots fixed. The samples were collected in wide mouth glass bottle (1.0 litre) and all the samples were brought to the laboratory and stored at 4^0 temperature in refrigerator till the analysis was completed. The details of sampling procedure was same as described in Indian Standard methods of sampling and test for water used in industries I.S.I. New Delhi.

Samples of algae from each spots were made once a mounth. The samples were collected in standard manner in bottle of about 125 cc capacity which was filled with water obtained by towing a silknet for equal distance along four side of the spots on surface and at a depth of 6-8 inch. Another bottle was filled with tips and other portion of equatic angiosperms taken from near the surface of water. The collection being made with a little disturbance as possible. After the bottle had been left undisturbed over night the scum had settled and the clear water above was decanted off, 20 cc of material and water was left and this was preserved in 4% formalin for identification of sps.

The collected water samples were analysed for different variables by the standard methods described in Indian Standards Methods of Sampling I.S.I. New Delhi (1965). Samples were stored for further analysis after wet digestion with nitric acid and perchloric acid.

From the preserved sample algal materials were mounted on slides and examined in detail for their systematic position and periodicity.

Annual average value of important chemical parameters are furnished in Table No. 1.

RESULTS AND DISCUSSION

The occurrence and periodicity of algal samples studied are given in Table No. 2. The distributionof algae found in distillery effluent showed 14 sps. belonging to cyanophyceae, chlorophyceae and bascillariophyceae.

Blue green algae : Several important publications deal with the ecological distribution of cyanophyceae. Papers of Fritsch (1907), Pearsal (1932), Yoshimura (1932), Prescott (1938), Gonzalves and Joshi (1946), Rao (1955), Singh (1960), Philipose (1960), Venkateswarlu (1969b) and Munawar (1970) have led to some controversies. Many of them emphasize the importance of light, temperature, pH, CO_2, organic matter, alkalinity, nitrates and phosphates as factors important in determining the distribution of blue-green algae.

In the present investigation the blue green algae dominate the effluent. Abundance of Ocillatoria sps. was frequently observed throughout the year while blooming was recorded from points where there was organic enrichment, their bundance is attributed to favourable content of oxidizable organic matter and less dissolved

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Table-1 : Physico-Chemical Characteristics Distillery Effluent Variables.

Variables	Period of Samples											
	May 2010	June 2010	July 2010	Aug. 2010	Sep. 2010	Oct. 2010	Nov. 2010	Dec. 2010	Jan. 2011	Feb. 2011	Mar. 2011	April 2011
Colour	Brown	Yellow	Yellow	Light	Yellow	Brown	Brown	Brown	Brown	Brown	Brown	Brown
Temperature	24.5	22.5	21.9	24.0	22.5	22.7	21.2	20.1	20.9	21.0	29.2	28.8
pH	5.3	7.1	7.0	7.2	7.1	5.5	4.6	4.7	5.5	5.4	5.7	4.9
Corbonates as $CaCO_3$ meg/L	4.7	2.3	1.8	1.0	0.9	1.2	5.2	4.5	4.9	5.2	5.4	5.3
Bicorbonate as $CaCO_3$ meg/L	2.1	0.4	0.5	0.7	Nil	0.5	3.5	2.9	3.0	3.1	3.2	2.7
Chloride as $CaCO_3$ meg/L				47	59	50	525	563	549	546	403	521
Tatal Alkalinity as $CaCO_3$ meg/L	1040	998	1070	1225	1360	1310	1360	1226	1553	1336	1229	1249
Nitrite as N mg/L	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	0.1	0.1	Nil
Total Hardness as $CaCO_3$ meg/L	1260	691	784	860	847	919	2300	1240	1720	2100	1471	2251
Alkaline hardness as $CaCO_3$ meg/L	724	371	348	225	272	371	860	846	835	826	853	849
Non hardness as $CaCO_3$ meg/L	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Total solids in mg/L	1547	772	906	1060	729	1020	2008	1920	1847	2053	1840	1912
Total dissolved solids in mg/L	1007	880	977	1250	1191	1421	1425	1408	1360	1235	1550	1252
Total suspended solids in mg/L	789	691	684	772	712	742	912	925	872	960	847	919
Dissolved oxygen mg/L	0.9	1.4	1.6	1.7	2.1	2.0	Nil	Nil	Nil	Nil	Nil	Nil
Oxygen consumed by KN_nQ_4 in 3 hr	1.2	1.6	1.7	1.7	1.9	2.1	1.0	1.1	1.2	1.2	1.1	1.1

oxygen. Phormidium and Aphanocapsa were more abundant in polluted zones than in clear water. Aulosira, Lyngbya, Scytonema and synecocystis were recorded in many points. Microcoleus was recorded same at one point only.

Green Algae : Waters favouring green algae are chemically distinct from those favouring blue gren algae and diatoms (Pearsall 1922; Storm, 1928; Gonzalves and Joshi, 1946; Prescott, 1948; Rao 1955; Philipose, 1960; Zafer, 1964). Work of Hutchinson (1967) and Munawar (1970) have shown that even maongst the green algae volvocales, chlorococcales and desmieds have different physiological and ecological preferences. Green algae in present study are only a few consisting of four sps with dominance of Spirogyra over Cladophora. Spirogyra was recorded throughout the year where as Oedogonium and Vaucheria were recorded at few point and a few months of a year. Volvacales are total absent.

Diatoms : Diatomes are represented by only two sps. In present study genera Navicula was found to be very bundant throughout the year. Teh abundance is attributed to favourable contents like less dissolved oxygen, oxidizable organic matter and absence of high water currents.

Table-1 : Physico-Chemical Characteristics Distillery Effluent Variables.

Algae	Period of Samples											
	May 2010	June 2010	July 2010	Aug. 2010	Sep. 2010	Oct. 2010	Nov. 2010	Dec. 2010	Jan. 2011	Feb. 2011	Mar. 2011	April 2011
1. Oscillatoria	+	+			+	+	+	+	+	+	+	+
2. Phormidium		+				+	+	+	+	+		
3. Lyngbya								+	+	+		
4. Microcoleus						+						
5. Aphanocapsa						+	+	+	+	+		
6. Aulosira		+	+	+	+							
7. Scytonema	+				+	+						
8. Synochocystis	+				+	+						
9. Navicula		+	+	+		+	+	+	+	+	+	
10. Pinnularia	+			+	+		+	+	+	+		+
11. Spirogyra	+			+	+		+	+	+	+		+
12. Vaucheria					+				+			
13. Oedogonium	+	+				+			+	+		
14. Cladophora	+		+		+		+	+	+		+	+

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