

Analysis of waste water from different waste water systems

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(Received: March 12, 2008; Accepted: May 17, 2008)

ABSTRACT

The environment, in which organism exists, has a profound effect on the behavior of organism. Temperature and pH are the two major abiotic factors governing the growth and activity of microbes. Microbes secrete number of degrading enzymes to degrade waste products. The microbes also have the ability of sorption the pollutants like heavy metals. Present work shows the analysis of microbes present in different environment of waste water of many industries and ponds. The fungal flora present in this waste water was incubated and isolated.

Industrial water samples showed the pH range of 9-9.6, whereas the pond water sample showed the pH range of 7.5-8.8. High percentage of the organic matter was obtained in pond water (0.134%) as compared to industries waste water (0.045%). Industrial waste water showed the high Ca²⁺ metal concentrations. The maximum number of fungal species (*Aspergillus candidus*, *A. terreus*, *A. fumigatus*, *Humicola species* and *Talaromyces emersonii*) were isolated from pond water because of high organic matter (in %) and low pH as compared to industrial waste water.

Key words: Industrial waste water, Pond water, Organic matter, BOD, Fungal flora, Water analysis.

INTRODUCTION

The efforts to supplement available water resources in many parts of the world have resulted in the increased use of effluents for irrigation. In areas where fresh water is limited, the use of effluents for agricultural purpose has been in common practice in the last few decades¹. One of the potential side effects of this practice is long term deterioration of ground water quality, as this effluent contains characteristics ionic composition, high organic matter and pH.

The treated waste water contain higher concentration of suspended and dissolved organic

and inorganic matter compared with fresh water. The diversified abiotic factor like dissolved organic matter, ionic strength and its composition as well as pH has a degree of impact on inhabiting mycoflora and fauna, which in turn may affect the utility of waste water for irrigation and recycling. Waste water bodies may also contain heavy metals, which may present adverse effect on the growing vegetation. Therefore, the present study has been undertaken to look into the physicochemical factors of the waste water and the natural water system of the Bareilly and neighborhood region. The impact of the ecological factors on growing mycoflora of the habitat has been observed and results are presented in this paper.

EXPERIMENTAL**Isolation and Identification**

Water samples were aseptically collected from different industries and ponds of Bareilly and nearby region. Samples were analyzed for their

fungal species by direct and dilution-plate method, using yeast powder soluble starch (YpSs) medium. The Petri plates were incubated at $45 \pm 1^\circ\text{C}$ for the growth of thermophilic fungi and were observed after two days.

Table 1: Heavy metals in pond and industrial waste water

S. No.	Sample collection Site	Concentration of heavy Metals (in $\mu\text{g/ml}$)					
		Ca	Cd	Fe	K	Mo	Mg
A. At Industrial Site							
1.	Mercury Bakery	112	0.048	0.21	21.30	0.11	0.46
2.	Kamal Bakery	106	0.056	0.18	20.00	0.16	0.33
3.	Camphor	98	0.34	0.11	14.00	0.33	2.27
4.	Chemical Industry	56	0.38	0.17	23.80	3.80	2.33
5.	Brindavan Beverage	89	0.033	0.23	17.00	1.23	0.59
6.	Pashupati Plywood	148	0.41	0.37	27.77	5.61	2.26
B. At Pond Site							
1.	Bansi Nagla	97	0.39	0.26	19.05	2.11	1.30
2.	Ganesh Nagar	80	0.21	0.30	17.02	1.16	2.31
3.	Gosai Gotia	104	0.30	0.22	18.00	5.00	1.27
4.	Madinath I	120	0.25	0.36	12.00	7.38	2.01
5.	Madinath II	125	0.22	0.28	13.60	7.26	1.24
6.	Near Rohilkhand	115	0.36	0.31	10.78	2.61	3.16

Table 2: Different Physicochemical parameters

S. No.	Sample Collection Site	pH	Temp.($^\circ\text{C}$)	BOD (mg/l)	OM(%)
A. At Industrial Site					
1.	Mercury Bakery	8.7	31.7	41	175
2.	Kamal Bakery	8.3	28.0	38	260
3.	Camphor	9.6	30.3	60	38
4.	Chemical Industry	9.0	29.4	51	165
5.	Brindavan Beverage	8.9	30.0	49	43
6.	Pashupati Plywood	8.4	31.0	85	255
B. At Pond Site					
1.	Bansi Nagla	8.7	30.1	92	11
2.	Ganesh Nagar	9.0	28.4	50	91
3.	Gosai Gotia	8.8	27.0	69	133
4.	Madinath I	9.1	27.3	49	122
5.	Madinath II	8.4	28.0	30	85
6.	Near Rohilkhand	8.2	30.0	94	240

Table 3: Type of Fungi Isolated

S. No.	Sample Collection Site	Isolated Fungi
A. At Industrial Site		
1.	Mercury Bakery	<i>Aspergillus fumigatus</i> <i>Aspergillus niger</i> <i>Aspergillus terreus</i> <i>Aspergillus candidus</i> <i>Aspergillus flavus</i> <i>Sporotrichum thermophile</i> <i>Chetomium thermophile</i> <i>Talaromyces emersonii</i> <i>Humicola species</i>
2.	Kamal Bakery	<i>Aspergillus fumigatus</i> <i>Aspergillus niger</i> <i>Aspergillus terreus</i> <i>Aspergillus candidus</i> <i>Aspergillus flavus</i> <i>Chetomium thermophile</i> <i>Emericella nidulans</i>
3.	Camphor	<i>Aspergillus fumigatus</i> <i>Aspergillus terreus</i> <i>Aspergillus candidus</i> <i>Aspergillus flavus</i> <i>Sporotrichum thermophile</i> <i>Chetomium thermophile</i>
4.	Chemical Industry, C. B. Ganj	<i>Aspergillus fumigatus</i> <i>Aspergillus niger</i> <i>Aspergillus candidus</i> <i>Aspergillus flavus</i> <i>Chetomium thermophile</i> <i>Talaromyces emersonii</i>
5.	Brindavan Beverage	<i>Aspergillus fumigatus</i> <i>Aspergillus niger</i> <i>Aspergillus candidus</i> <i>Chetomium thermophile</i>
B. At Pond Site		
1.	Bansi Nagla	<i>Aspergillus fumigatus</i> <i>Aspergillus candidus</i> <i>Aspergillus flavus</i> <i>Chetomium thermophile</i>
2.	Ganesh Nagar	<i>Aspergillus fumigatus</i> <i>Aspergillus flavus</i> <i>Humicola griesea</i> <i>Humicola insolence</i>
3.	Gosai Gotia	<i>Aspergillus fumigatus</i> <i>Aspergillus flavus</i> <i>Chetomium thermophile</i> <i>Humicola insolence</i> <i>Sporotrichum thermophile</i> <i>Rizopus oryzae</i>
4.	Madinath I	<i>Aspergillus fumigatus</i> <i>Aspergillus candidus</i> <i>Chetomium thermophile</i> <i>Talaromyces emersonii</i> <i>Humicola species</i>
5.	Madinath II	<i>Aspergillus fumigatus</i> <i>Aspergillus flavus</i> <i>Aspergillus candidus</i> <i>Chetomium thermophile</i> <i>Sporotrichum thermophile</i>
6.	Near Rohilkhand Plywood	<i>Humicola species</i> <i>Aspergillus fumigatus</i> <i>Aspergillus niger</i> <i>Aspergillus terreus</i> <i>Aspergillus candidus</i> <i>Aspergillus flavus</i> <i>Humicola species</i>

Method

Waste water samples were aseptically collected from different industries and ponds of Bareilly. The pH of sample was measured and organic matter was calculated by Walkey & Black method (1947). The percentage of organic matter was calculated by the formula

$$\text{organic matter percentage} = \frac{6.79}{W} \left(1 - \frac{T}{S} \right)$$

where,
W = Volume of sample
T = Sample Titration
S = Blank Sample

After this, the thermophilic fungal were isolated from collected waste water samples using the YpSs medium at pH 7 at 45°C (War cup, 1950). Co-relation of the isolated fungal forms was inferred with the different physicochemical properties of the waste water like pH, temperature, BOD and % organic matter. The pH is determined by using Systonic pH system 361, heavy metals (Ca, Cd, Fe, K, Mo & Mg) using ECIL Atomic Adsorption Spectrophotometer, BOD is calculated by using AHPA 2000 (A Standard methods for analysis of water and waste water, American Public Health Association, Washington D.C., 2000.) and Organic matter was determined by Walkey & Black method 1947.

RESULTS

Table 1 summarizes the concentration of different heavy metals present in samples collected from different industrial site and different pond sites of water in the Bareilly region. Table 2 describes different physicochemical parameters like pH, temperature, BOD and % organic matter at different pond and industrial sites. Table 3 shows the type of different species of fungi isolated from the collected samples of waste water from different sites.

The result showed that the amount and types of fungi isolated was very much higher in the samples collected from pond site than that collected from the industrial site.

DISCUSSION

The current work indicates that the maximum species of the enzymes were obtained from the fungus isolated from the water samples collected from the pond sites rather than the fungus isolated from the water samples collected from the industrial sites. This is due to the high concentration of the heavy metals, biological organic matter, pH, organic matter, etc. which are favorable for the growth of the fungi.

Industrial water samples showed the pH range 9-9.6 and pond water sample showed the pH range 7.5-8.8. A High percentage of the organic matter was obtained in pond water 0.134% while in industries waste water was only 0.045%. Industrial water and pond water showed a high concentration of Ca⁺² metal. The maximum numbers of fungal species were isolated from pond water because of high Organic matter and low pH. Highest % of organic matter was obtained in the pond water 0.134 % while it was 0.045 in the industrial water and portable water has neglectable value of organic matter.

CONCLUSION

From the present study, we can conclude that the waste water obtained from the different industrial sites of the Bareilly region is less polluted than that of the environmental condition facing pond water.

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