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Treatment and Analysis of Industrial Effluent using Phycoremediation Technology

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Abstract:
In this study an attempt has been made to treat and analyze the industrial effluent with the help of different algae species using phyco - remediation technology and to make treated water available for reuse for gardening, domestic use etc. It also guide us to check whether the pH, COD, BOD and other metals like potassium, phosphorous, nitrogen are reduced to greater extent to make the water harmless for reuse. The effluent sample was collected and initial analysis was carried out for the sample. Screening process was done using test tubes and conical flasks with 10ml and 50 ml effluent respectively. Totally five different algae species chlorella, scenedusmus, chlorella, desmococcus, chrococcus and chlorogloya are incubated for determination of best adaptable species for culture and treatment. In general, all industrial effluents are highly acidic and contain high total dissolved solids. Here initial analysis was carried out on the effluent sample to know its properties and the final treated effluent after phycoremediation was also be analyzed to know the reduction amount of pH, BOD, COD and other metals to make sure that the water is reusable.

Keywords:*Phyco- remediation, Microalgae, industrial effluents, reuse.*

I INTRODUCTION

Waste water treatment can be carried out using Algae for the removal of coliform bacteria, N and/or P, heavy metals etc.,(N. Abdel-Raouf et al.,2012). Phycoremediation is the use of algae for the removal or bio transformation of pollutants from waste water (P Hanumantha Rao et.al 2011). Treatment of industrial effluent using this method is an alternative to the conventional methods. Microalgae have the ability to fix the excess carbon dioxide present in the environment and release the oxygen (Satpal and Khambete A. K. 2016). Freshwater bodies like ponds, lakes, streams, rivers etc., are experiencing the problems of siltation, eutrophication, contamination by heavy metals, chemical pollutants etc., This is occuring because of deforestation, mining, industrial developments in the catchments etc., (John J. 2003).

Algal growth controls the nitrogen and phosphorous removal efficiency in the system. Hence maximum algae productivity influences the removal of nutrients in an effective manner. Different algae will have different requirements for their growth. Important factors for the growth of algae includes water, light, minerals, carbon dioxide etc., The main objective of current study is to treat and analyze the leather industrial effluent with the help of different algae species using phyco-remediation technology and to make treated water available for reuse for gardening, domestic use etc. It also guide us to check whether the pH, COD, BOD and other metals like phosphate, ammonia, nitrogen etc., are reduced to greater extent to make the water harmless for reuse.

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II METHODOLOGY

The algal pure strains are kept under standard controlled environment. Specially designed incubators are used for this purpose, where the routine work can be carried out in a strict hygienic controlled environment. "Batch culture" and "Continuous culture" are the methods used for culturing algae. The culture system in common use is the Batch culture system as it is simple to perform and also less expensive. In this system the algal population cell density constantly increases while the other nutrient components decrease over time. In Continuous Culturemethod, culture has been added with fresh medium at constant rate and old media is removed at the same rate. Hence in this method the culture sustains with required amount of nutrients and hence deficiency of nutrients will not arise. In this study batch culture method has been adopted for the industrial waste water treatment.

The methodology adopted in this study is shown as the flowchart in Fig.1.

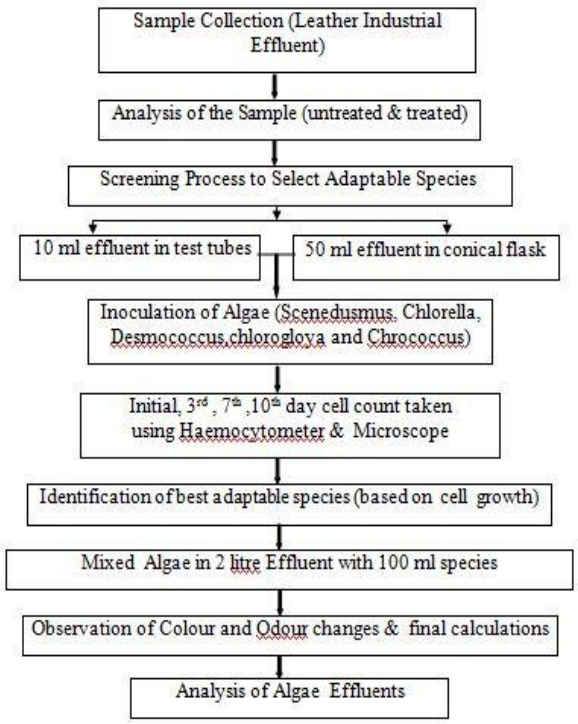

Fig.1 Methodology flowchart

III ANALYSIS, RESULTS AND DISCUSSIONS

Four litres of effluent sample was collected and initial analysis was carried out for the sample. Screening process was done using test tubes and conical flasks with 10ml and 50ml effluent respectively. Five different algae species scenedusmus, chlorella, desmococcus, chlorogloya and chrococcus are incubated for determination of best adaptable species for culture and treatment. In five test tubes 9ml of effluent sample and 1ml of algae (Chlorella, Senedemes, Desmococcus, Chroococcus and Chlorogloya) were added. Cell count was taken using haemocytometer and values were observed on initial, 3rd, 7th, 10th day. Among the five micro algae best adaptable algae was chosen based on cell growth. Based on cell growth we have selected two algae (chlorella and chlorogloya). 50ml of chlorella and 50ml of chlorogloya were added in 2 litres of sample. Observations were made for 20 days. Table 1 shows the cell count value in two litres treated water sample.

Table 1 Cell count value in two litres treated water sample

Sample/ Day	Day1	Day3	Day 5	Day 8	Day 13	Day 15	Day 17	Day 20
Mixed culture (chlorella+ chlorogloya)	89	85	108	130	172	251	362	382

The analysis of treated effluent was carried out for the parameters such as pH, COD, BOD, TSS, TDS, lead, chromium, sulphate, nickel, cadmium, oil & grease, phosphorus, ammonia, nitrogen and potassium.

Table 2 shows the comparison of the results of untreated and treated samples and Figure 1 shows the percentage reduction in various parameters of treated effluent sample.

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Table 2 Comparison of the results

S.No.	Parameters	Untreated sample in mg/l	Sample treated with algae in mg/l	(%) reduction	Permissible limits in mg/l
1	Ammonium	281	247	0.34	0.02-0.4
2	BOD	1200	600	6	0.8-5
3	Cadmium	BDL(DL:0.001)	BDL(DL:0.001)	0	1-10
4	Chloride	154	116	0.38	250
5	COD	4781	3665	11.16	10
6	Lead	0.062	0.04	0.0002	20
7	Nickel	0.28	0.02	0.0026	141
8	Total nitrogen	478	366	1.12	300-750
9	Oil&grease	28	18.4	0.096	20
10	pH	8.10	8.92	-0.0082	6.5-9
11	Sulphate	970	848	1.22	250
12	Total chromium	55.5	51.25	0.0425	20-105
13	TDS	5000	4860	1.4	2100
14	TSS	1384	1196	1.88	1600

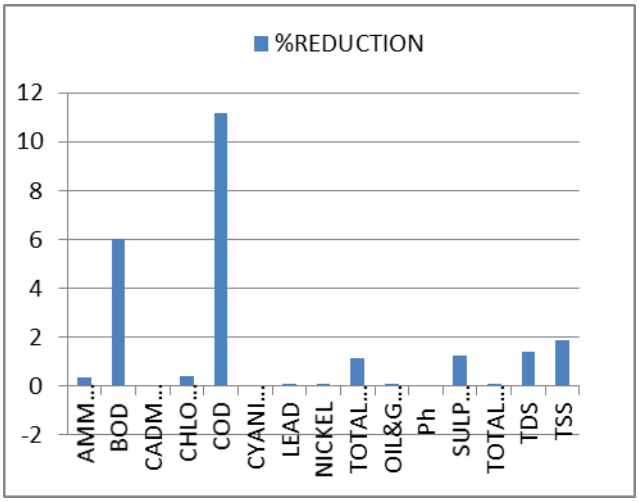

Figure 1 Percentage reduction in various parameters of treated effluent sample.

IV. CONCLUSIONS

The conclusions arrived from the current study are as follows:

- The sample was collected from the source and initial analysis was carried out for various parameters.
- The screening process for 10 ml and 50 ml effluent in test tubes & conical flask respectively was done to determine the adaptable species of algae.
- The cell counts are taken from initial day to 10th day properly using haemocytometer.
- The chlorella and chlorogloya species was cultured in 2 litre effluent due to its increased cell growth.
- The algae treated effluent was given for analysis and got the reduced amounts of Ammonium, BOD, Chloride, COD, Lead, Nickel, Total nitrogen, pH, Total chromium, TSS .
- The nutrients amount are changed and found as permissible and reusable in future.
- Based on the results the chlorella and chlorogloya algae were found to be the best adaptable species for the effluent treatment.

REFERENCES

1. P Hanumantha Rao et.al., "Application of phycoremediation technology in the treatment of wastewater from a leather-processing chemical manufacturing facility" Water SA Vol. 37 No. 1, January 2011.
2. John J. "Phycoremediation Algae as Tools for Remediation of Mine-Void Wetlands Modern Trends in Applied Aquatic Ecology" Springer, Boston, MA , 2003, pp.133-147.
3. N. Abdel-Raouf et al. "Microalgae and wastewater treatment" Saudi Journal of Biological Sciences Vol. 19, 2012, pp.257–275
4. Satpal and Khambete A. K. "Waste Water Treatment Using Micro-Algae - A review Paper"International Journal of Engineering Technology, Management and Applied Sciences Vol.4, Issue 2, 2016, pp.188-192.