ACCLIMATIZATION OF ACTIVATED SLUDGE FOR BIODEGRADATION OF PHENOL IN WASTE WATER

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Introduction. Phenol and its derivatives are present in numerous industrial effluents. Those effluents are toxic and dangerous for the environment and the human being. Thereby it is important to perform adequate treatments to remove phenolic compounds from sewage.
This project studies the phenol degradation via microorganisms present in activated sludge. Phenol is an inhibitor of the microbial growth and their biodegradation is hindered by the toxicity that exercises at high concentrations; for this reason, the microorganisms were acclimated gradually increasing concentrations of phenol, and assess their growth rate and its ability to degrade phenol after they have been acclimated.

Methods. The concentration of biomass was determined using the dry weight technique, subsequently to quantify the total amount of reducing sugar produced during an enzymatic reaction the *Dinitro Salicylic Acid (DNS)* method was used. This method is a colorimetric technique that uses *3,5-Dinitrosalicylic acid* followed by an spectrophotometric determination at 371 nm. To determine the concentration of phenol in the aqueous medium the colorimetric method of the 4-aminoantipyrine was used. The absorbance at 504 nm was measured with an Perkin Elmer Lambda 35 UV/Visible spectrophotometer. The concentration of phenol from the sample was obtained by the comparison with the curve of calibration of 0 – 50 mg/L. Finally to determine the pH, the diluted oxygen and the CO_2, a LabQuestVernier was used.

Results. The table 1 shows the data gathered form the samples taken every hour during 8 hours and one last sample after 24 hours. These experiments were performed with a pH of 7, at a temperature of around 25ºC, a concentration of yeast extract of 0.5 g/L and with an agitation of 250 rpm.

For experimentation, a culture medium was prepared with 500 mg/L of yeast extract, 10000 mg/L of sucrose, 8 mg/L of phenol, 100 ml of inoculum and 900 ml of water getting a volume of 1 L.

Each experiment samples were taken every hour for 8 hours and one last 24 hours to determine the degradation of phenol and sucrose.

Time (hours)	T(ºC)	pH	CO_2 (mg/L)	OD (mg/L)	Sucrose (mg/L)	Phenol (mg/L)
0	25	6.5	1009	4.5	10595	7.67
1	24	6.5	944	4.1	9087	7.64
2	24	7	983	3.2	8491	7.62
3	25	7	940	4.4	5093	7.67
4	24	6.5	965	4.6	3181	7.66
5	25	7	923	5.5	880	7.66
6	25	6.5	872	4.7	122	7.55
7	25	6.5	916	4.4	107	7.42
8	25	7	769	4.2	102	7.37
24	25	7	738	4.1	132	6.15

Table 1. Growth medium used for the degradation of sucrose and phenol

The Figure 1 shows the graph of the results obtained in the experiment shown above where it is noted that the 10 g/L of sucrose were consumed rapidly and that the 8 mg/L of phenol were also deteriorate slowly. At the same time the concentration of dissolved oxygen beat in a range.

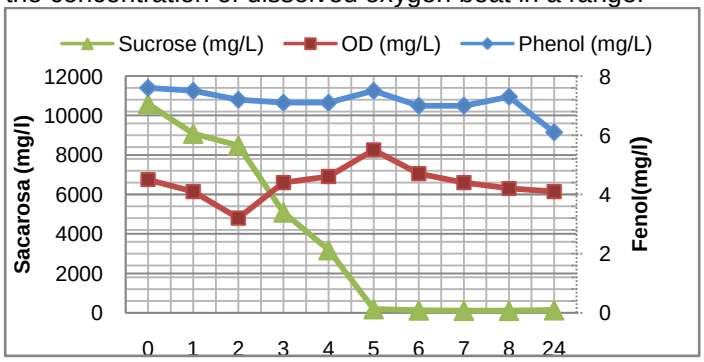

Fig.1 Graphic of the data obtained for the degradation of sucrose and phenol

Conclusions. To carry out the degradation of phenol by means of activated sludge, it is necessary to acclimatize he microorganisms to the compound before degradation. The results obtained show that there is inhibition when they were acclimated to phenol, however there is a greater rate of degradation in the sludge were subjected to acclimatization for one week.

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