Research Article

©*ISISnet Publishers*

Bioscience Research, 11(1): 01-03, 2014
Available online at **www.isisn.org**
Print ISSN: 1811-9506
Online ISSN: 2218-3973

Use of the rose pulp as a bio sorbent to remove the Cu^{+2} metal ion from waste water.

Y. Kara[1*]

[1]1Science & Art Faculty, Department of Biology, Pamukkale University, 20017-Denizli, **Turkey**.
***Corresponding author**

The biosorption of Cu^{+2} ions by the rose pulp which was obtained from attar of rose production plant was studied in a shaker that functions at constant temperature and stirring tempo. The effect of the variable pH and metal ion concentration on biosorption efficiency was observed and the relevance of the biosorption data on Freundlich and Langmuir adsorption models was analyzed. It is evident that; the best adsorption of copper metal in the pulp of rose was observed at a temperature of 25 ºC, stirring tempo of 150 rpm with a mass of m=1 g is realized between the first 30 minutes and 1 hour, and the optimum pH was 5 or 6. It was also verified by the graphics and Freundlich isotherm and Langmuir isotherm obtained by the results that the best adsorption of metal was at the pH 5 by the rose pulp.

Key words: Biosorption, heavy metal, adsorption, Rose pulp, *Rosa damascena*.

Metal accumulation active processes generally by the entire alive cell are called “Bioaccumulation”. Biosorption means binding the metal ions from the aqueous solutions by the microorganisms. in recent years, microorganisms such as algae, fungi, bacteria are widely used to insulate heavy metals from wastewater, separate trace metals from the matrix and concentrate them (Ajmal et al. 2003). The sources of the heavy metals are mining industry, metal industries and industrial establishments. The purification methods of wastewater containing heavy metals are reduction-precipitation, oxidation-precipitation, neutralization and ion exchange (Aydın et al. 2004).

Adsorption as the wastewater treatment is the process of using substances called adsorbent, which can bind to specific materials in order to eliminate these materials from the wastewaters. Three different adsorption types are defined depending on the type of the tensile force between the absorbing surface and dissolved particles: physical adsorption, chemical adsorption and ionic adsorption. Some of the factors affecting biosorption are as follows: blending speed, pH, temperature, the features of the substance biosorbed and the solvent. Biosorption of the heavy metal ions onto the biosorbent surface accords with adsorption isotherms. These are Freundlich, Langmuir and BET (Brunauer, Emmett and Teller) isotherms.

MATERIALS AND METHODS

The sediment necessary for the rose (*Rosa damascene)* residue biomass we have used in our study was provided from a rose oil company in the province of Isparta. The chemicals used in this study are of the quality of Merck. Cu was used to prepare water containing heavy metals artificially and 1M HCl and 0,1 M HCl were used to adjust pH. Adsorption studies have been realized in a blender which can operate at fixed temperature and blending speed with capped tubes of 10 ml. It was accepted that the biosorbent was to be added to the metal solution at t = 0 and samples were taken periodically. After the samples taken were centrifuged (6000g/30sc), they were filtered through Sartorius filter system with 0.45 membrane filter paper and the sediment was

Table :1. Metal adsorption of rose biomass at different concentrations

Metal Concentration (ppm)	Adsorbed	%Ads	Kd mL/g	Cads (mg/g)	Conc.(mg/L)	Ce/Cads (g/L)	log Ce	Log (x/m)
50	38,4	76,80	331,03	384	11,60	0,0302	1,0644	2,5843
75	57	76,00	316,67	570	18,0	0,0315	1,2552	2,7558
100	75,3	75,30	304,86	753	24,70	0,0328	1,3926	2,8767
125	93	74,40	290,63	930	32,0	0,0344	1,5051	2,9684
150	110	73,33	275,00	1100	40,0	0,0363	1,6020	3,0413
200	144	72,00	257,14	1440	56,0	0,0388	1,7481	3,1583

K_d: amount of metal onto sorbent/amount of metal in solution
C_{ads}: Concentration adsorbtion

used to determine the metal ion residue concentration without being adsorbed. The sediment was dried in open air after taken to the laboratory and then it was pulverized in blender. The sediment pulverized was riddled with sieves with different apertures. The residue on sieve was preserved in closed plastic bags. The amount of biosorbent necessary for the study was obtained through measuring this dry mass with microbalance. Cu stock solution of 1000 mg/L was prepared by raising 5 ml of Cu to 50 ml with deionized water. Cu solutions at different concentrations were used by diluting from 1000 mg/L of stock solutions. The free Cu ion concentration in the biosorption environment was determined by using atomic absorption spectrophotometer (PERKIN ELMER, AAS 700).

RESULTS AND DISCUSSION

For the adsorption of heavy metals from wastewaters they used montmorillonite and betonies clays. As a result of the study, the adsorption capacities of natural clays on Cu and Zn metals have been identified and the adsorption isotherm was defined with Freundlich isotherm equation (Bassari et al. 1996).They have carried out studies to recycle the wastewaters by eliminating Cd (II) metal by using rice husk (Madrid and Camara 2001).They have shown that *Pinus sylvestris* cones adsorb the lead, heavy metal ion in the water, in accordance with Freundlich isotherm (Ucun, 2001). They have identified the high adsorption capacity of chromium, the heavy metal ion in water, by using *Pinus sylvestris* cones, in another study (Ucun et al. 2002). They have examined the separation of Sr, Cs and Th ions from aqueous solution by using pumice. They have stated that the pH of the solution is effective in the separation of ions from the solution and the binding amount of Th ions is higher (Ucun et al. 2003). In this study, we have aimed to use the rose residues to identify their ability to separate the heavy metal ions from the water, thus preventing the rose residues from accumulating around and putrefying. In previous studies, the rose residue has never been used as biosorbent to separate the heavy metal ions from wastewaters.

As a result of this study, it has been concluded that the copper heavy metal is adsorbed by rose residue between 30 minutes and 1 hour, the most suitable pH can be used as pH 5 or 6 and the best adsorption occurs at pH 5. It has been confirmed that with Freundlich isotherm and Langmuir isotherm which were calculated by results the rose residue adsorbs the copper heavy metal ion through the charts. When the correlation between time and adsorption was examined in Minitab, correlation was found to be -0,068 and the P value was 0,885. It was concluded there is a negative relation between duration and concentration (Table 1).

According to the Freundlich and Langmuir isotherm curves, it was identified that the rose residue adsorbs the copper heavy metal. When the relation between pH and adsorption was examined with the help of Minitab program, it was calculated as –0.706 and the

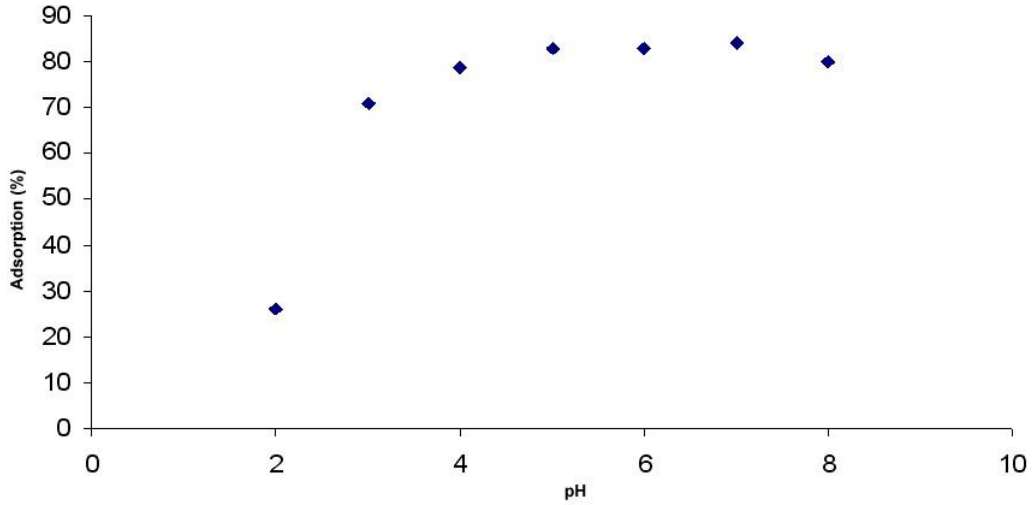

Figure 1: Metal adsorption of rose biomass at different pH

P value was calculated as 0,076 and the relation was found to be negative. When the relation between adsorption and time was examined in the correlation test carried out in Minitab for the identification of the best adsorption duration on the basis of minute at pH 5, the correlation value was found to be r=-0,944 and the P value was obtained as 0,001 As a result, there is a negative relation between time and adsorption at pH 5 When the relation between time and adsorption on the basis of minute was examined at pH 6, r= -0,808 was found and P value was obtained as 0,028, thus it was seen that there is a negative relation between them (Fig 1).

REFERENCES

Ajmal, M., Rao, R., Anwar, S., Ahmad, J., Ahmad, R. 2003. Adsorption studies on rice husk: Removal and recovery of Cd (II) from waste water. *Bioresource Technology* 86: 147–149.

Bassari, A., Akyüz, T., Kurtcebe, T. 1996.The removal of Th, Cs and Sr ıons from solutions using granulated Pumice stone, *Journal of Inclusion Phenomena and Molecular Recognition in Chemistry* 26: 83-88.

Madrid, Y. and Camara, C. 1997. Biological substrates for metal and preconcentration and speciation *Trends in Analalytic Chemisty* 16 :36-44.

Sarı, S Aydın, M.E., Özcan, S. 2004."Removal of heavy metals by natural clay", Environment 2004, I. National Environment Cong., Cumhuriyet Univ., Engineering Faculty, 13–15 November, 2004, Sivas, Turkey.

Ucun, H. 2001. Biosoption of Heavy metal from aqueous solution by cone biomass of *Pinus sylvestris*, *Atatürk Univ. Science and Letters Faculty Journal* 35:2191-2200;

Ucun, H., Bayhan, Y.K., Kaya, Y., Cakıcı, A., Algur, O.F. 2002 Biosorption of chromium (VI) from aqueous solution by cone biomass of *Pinus sylvestris*. *Bioresource Techno*logy. 85:155-158.

Ucun, H., Bayhan, Y.K., Kaya, Y., Cakıcı, A., Algur, O.F. 2003. Biosorption of lead (II) from aqueous solution by cone biomass of *Pinus sylvestris*. *Desalination*, 154: 233-238.