

Efficiency of Lead Removal from Synthetic Wastewater by Using *Musa acuminata* Colla as Adsorbent

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Abstract: The objective of this research was to study the efficiency of lead removal from synthetic wastewater by using *Musa acuminata* Colla as adsorbent. Effect of initial pH of synthetic wastewater, initial concentration of lead and time required for equilibrium were investigated and determined adsorption capacity of adsorbent. The results showed that the optimum pH ranges for quantitative removal of lead, initial concentration of lead and time required for equilibrium were 2.0-6.0 (pH), 100 mg/L and 24 hours, respectively. After being applied the optimum condition founded from the research to obtain the maximum adsorptive capacity of lead from batch and column methods by using Freundlich adsorption isotherm, we found that *Musa acuminata* Colla had maximum adsorption of lead at 1.77 and 2.50 mg.g⁻¹ for batch and column methods, respectively.

Introduction: Lead is a heavy metal that can harm the human's body systems such as nerve system, digestive system and skeleton system. The human body can intake lead by breathing or swallowing lead dust or paint chips containing lead. The source of lead released to the nature included lead smelters and battery factory. Many ways to remove lead exist; for example, precipitation, electrolysis and ion exchange, but these are expensive methods. Agricultured waste is an alternative way to remove lead owing to its low cost. In this research, we employed *Musa acuminata* Colla of the biomass, to study its possibility for lead removal from wastewater. Also the effects of initial of pH and time required for equilibrium on lead remove efficiency were studied.

Methodology : The cleaned adsorbent was mixed with 1.0 M HCL in the ratio of 100 g adsorbent per 1.0 litre acid and was heated for 3.0 hours. After that the acid was completely removed from the adsorbent by washing with deionized water. It was then dried overnight in an oven at 110 °C. By batch experiments, 25 mL of lead solution was mixed with adsorbent. Parameter studied were initial pH of wastewater (2.0-6.0), initial concentration of lead(2.0-200.0 mg/L), time required for equilibrium (1.0-48.0 hours). Capacity of adsorption was calculated by Freundlich model. The lead solution was analyzed by AAS.

Results, Discussion and Conclusions : The research found that the suitable pH for lead adsorption onto *Musa acuminata* Colla was 4.0-6.0. The most suitable initial lead concentration was 100 mg/L, time required for equilibrium 24 hours. Adsorption capacity for *Musa acuminata* Colla were 1.77 and 2.50 mg/g for batch and column methods, respectively. After being applied the optimum condition found from the research for lead removal from wastewater, it was found that lead was adsorbed as 90%. The results from the experiment showed that *Musa acuminata* Colla was suitable as lead removal sorbents.

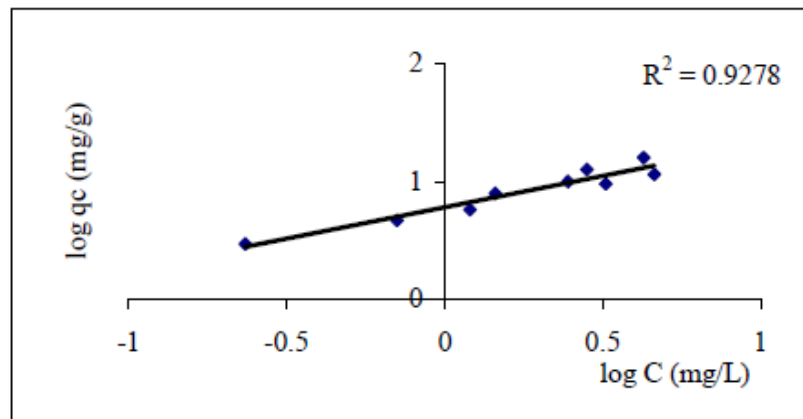


Figure 1. Linearized Freundlich isotherm for lead sorption by *Musa acuminata* Colla

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