

Effects Of Lime and Rice Husk Ash Addition on Permeability and Filtration Efficiency of Heavy Metal-contaminated Soil

ABSTRACT

Heavy metal contamination of soil is a widespread environmental issue that poses significant risks to human health and the ecosystem. Conventional soil remediation methods are often expensive and invasive, highlighting the need for alternative, cost-effective, and sustainable approaches. The research aims to study the effects of lime and rice husk ash treatment on the soil contaminated with 1% copper and cured for 1, 7, and 14 days. Research found that treatments decrease the permeability of soil due to the formation of calcium silicate hydrates, which contribute to the binding and hardening of the material. When the curing days are extended, the hydration reactions continue to progress, leading to further consolidation, reduced flow, and a further drop in permeability. For filtration efficiency, the value of chemical oxygen demand is decreasing from 325 mg/L to 37 mg/L with increasing curing duration under lime treatment, but the opposite trend is observed for rice husk ash, increasing from 46 mg/L to 352 mg/L. In terms of turbidity, a decreasing value with increasing curing duration is observed for both materials. The addition of binders initiates chemical reactions with substances present in the solution, leading to the formation of insoluble compounds or precipitates. These reaction products can contribute to the reduction of suspended particles and, consequently, lower turbidity. The same trends are observed in suspended solids. Research concluded that both treatments are able to change the permeability of heavy metal-contaminated soil and subsequently affect the filtration efficiency.