

The wastewater contaminants, including heavy metals, have been emerging due to urbanization and industries and becoming challenging for global. These contaminants are exceedingly difficult to eliminate from wastewater through conventional wastewater treatment methods which are very costly, produce sludge and improper elimination of contaminants takes place, leading to demand for more efficient, cost effective and sustainable alternative to remove heavy metals. Plant based mucilage is considered as natural, non-toxic, cost effective and sustainable alternative. Due to its less toxicity and ability to bind with contaminants and ability to remove them, *Lallemantia royleana* seeds offers optimal potential. In this study, mucilage is extracted through hot extraction method and further evaluate for characterization. UV-Visible spectrophotometer was used to assess the efficiency of mucilage to interact with contaminants. FTIR analysis confirmed the presence of functional groups including OH, COOH and C=O responsible for metal binding and facilitate adsorption. SEM-EDX and XRD demonstrated significant changes in surface morphology and confirm the crystalline nature, respectively. Overall, for different concentrations of lead the removal efficiency obtained around 80%. The highest removal of metal was observed at 110 minutes for different time intervals. The findings reveal that the polysaccharide-rich mucilage possesses active sites that can capture heavy metals and suspended particles, hence endorsing its application as a natural, non-toxic, cost effective and sustainable material for water filtration and helping the progress of green treatment methods.