Using Dimorphotheca sinuata in the Phytoremediation of Tailing Storage Facilities Contaminated by Gold Mining

Djan, Martha (School: The Potchefstroom High School for Girls)

Gold (Au) mining has detrimental environmental impacts on land and water (surface and groundwater) contamination. Tailing Storage Facilities (TSF), or mine dumps, may contain multiple contaminants such as inorganics (salts, metals and radioactive materials), cyanide compounds, explosive residues and other organic contaminants produced by mining processes. These contaminants negatively impact human (carcinogenic and mutagenic) and environmental health (ecosystem services), as well as animal and plant survival (food security, carbon sequestration, biodiversity) and thus, must be removed from the environment. Phytoremediation involves the use of the plant's ability to render toxic contaminants biologically inert by extracting, degrading, or sequestering contaminants. The aim of this study was to determine the ability of an indigenous plant, Dimorphotheca sinuata, to remediate tailings containing a range of contaminants at various concentrations. Tailings were collected from a TSF located in Krugersdorp, SA. The experimental design involved exposing plants, for six months, potting soil: to tailings at a 1:10 ratio whereas only potting soil was used as the control for this study. Contaminants were analysed monthly using Inductively Coupled Plasma–Mass Spectrometry. Concentrations of arsenic, cadmium, cyanide, iron, mercury, lead, and uranium significantly decreased ($p<0.05$) as sample time increased thereby eliciting D. sinuata's potential for phytoremediation. Similar trends in the decrease of cadmium and mercury may be attributed to the similar physicochemical properties of these metals. Future studies should determine whether the leaching of contaminants of interest from experimental pots is a significant factor.

Awards Won:

Fourth Award of $500