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Heavy metal removal using natural seed coagulants

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Heavy metals, such as cadmium, chromium, arsenic, mercury and lead usually arise from mining operations, fertilisers and pesticides, industrial wastes, untreated industrial wastewater and leachates from mining sites. These heavy metals generally move through different biogeochemical cycles of the ecosystem. They enter the food chain and hence result in bioaccumulation and biomagnification. Therefore, heavy metal contamination has ecological and biological significance. Human beings may get exposed to heavy metals through various routes, such as food and water consumption, direct skin contact, inhalation of polluted air with metal or occupational exposure. Many metals like iron and manganese are required for the basic physicochemical activities in the body. However, when they are elevated in the body, it causes many delirious effects. Heavy metals generate free radicals and damage biological molecules like lipids, proteins and nucleic acids. Additionally, they are neurotoxic and carcinogenic, hence leading to chronic effects and damage to the immune system. Hence it is important to remove this class of pollutants from water resources mainly. They can be removed from the environment by using natural seeds from plants, such as Moringa oleifera (drumstick tree), Strychnos potatorum (clearing-nut tree) and Ocimum sanctum (tulsi). Seeds have the ability to purify water by absorbing contaminants. Moringa oleifera seeds are widely used for the purification of water and also for the removal of heavy metals with their functional macromolecules. These molecules have the ability to absorb any heavy metal in the environment through a process called ion exchange or complexation. Moreover, Strychnos potatorum seeds are an anionic polyelectrolyte that contains carboxyl and hydroxyl groups that are responsible for the coagulation property. This property thereby helps in the removal of metals through the biosorption process. It has been found that Strychnos potatorum is effective in heavy metal removal even when used in low dosage. Therefore, plant-based seed coagulants can be used for heavy metal removal. This method is feasible for small scale utilisation, biodegradable, cost-effective, safer to use and easily available.

Keywords: Heavy metal, Seeds, Coagulants, Ocimum sanctum, Moringa oleifera, Strychnos potatorum

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