Ke ords: Bioremediation; Heavy metals; Microbes; *E - , ;* *L - , ;* Bioremediation strategies.

In rod c ion

Since the industrial revolution, heavy metals waste has been increased faster. e toxic metals are mostly used in the industrial

Principles of Bioremedia ion

Bioremediation is the process whereby organic wastes are biologically degraded under controlled conditions to an innocuous state, or to levels below concentration limits established by regulatory authorities [9]. By de nition, it is the use of living organisms, primarily microorganisms, to degrade the environmental contaminants into less toxic forms. ree essential components are needed for bioremediation. ese three components are microorganisms, food, and nutrients. ese three main components are known as the bioremediation triangle. Microorganisms are found almost everywhere on earth and nutrients are usually the missing ingredients that prevent successful bioremediation. We can nd out the microorganisms in water or soil where a su cient amount of food is available. However, if a contaminant is present it can become an additional food source for the microorganisms [10].

Ex-situ Bioremedia ion

E - , bioremediation is a biological process were excavated soil is placed in a lined above ground treatment area and aerated following processing to facilitate the degradation of organic contaminants by the indigenous microbial population. is process requires the excavation of contaminated soil or pumping of groundwater to enhance microbial degradation [15]. *E* - , bioremediation involves excavating the contaminated material and its treatment in above-ground facilities located on-site or o -site, whereas - , bioremediation are undertaken at the site of contamination. *E* - , methods involve extraction separation, treatment of secondary waste streams, and the proper disposal of the solid wastes. e - , treatment processes are better understood; hence, they are relatively easy to implement, monitor, and control. e treatment of radionuclide-contaminated soils, sediments, and wastes involves excavation followed by - , treatment or disposal. e common - , treatment for excavated soils is solidi cation or stabilization [8].

Concl sion

Heavy metal toxicities are the challenging task because it is harmful to human health via interference of the vital cellular functions of the human's body. Cadmium, mercury, copper, manganese, lead, and selenites are the metals and metalloids that are widely present in the environment. P-type ATPase system is exported the cytoplasmic ions to the periplasm and e ux transporters that are further exported periplasmic ions to the outside, these are the general mechanism of resistance for heavy metals like Co, Pb, and Cd, etc. Furthermore, in the metals detoxi cation by sequestration, binding factors will be involved in creating tolerance to heavy metals ions. *B* are very important for the bioremediation of heavy metals and more research is required for further improvement of bioremediation of heavy metals by microorganisms.

F re Perspec i es

Bioremediations is a very important strategy for solving the heavy metals ecosystem and environment pollution using the microorganisms. As we know that heavy metals toxicity is the major concern of our health issues so we have to develop a permanent solution for that via new modern technologies. We have