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Impact of Long Term Application of Municipal Solid Waste on Physicochemical and Microbial Parameters and Heavy Metal Distribution in Soils in Accordance to Its Agricultural Uses

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Abstract : Municipal Solid Waste (MSW), being a rich source of organic materials, can be used for agricultural applications as an important source of nutrients for soil and plants. This is also an alternative beneficial management practice for MSW generated in developing countries. In the present study, MSW treated soil samples from last four to six years at farmer’s field in Rohtak and Gurgaon states (Haryana, India) were collected. The samples were analyzed for all-important agricultural parameters and compared with the control untreated soil samples. The treated soil at farmer’s field showed increase in total N by 48 to 68%, P by 45.7 to 51.3%, and K by 60 to 67% compared to untreated soil samples. Application of sewage sludge at different sites led to increase in microbial biomass C by 60 to 68% compared to untreated soil. There was significant increase in total Cu, Cr, Ni, Fe, Pb, and Zn in all sewage sludge amended soil samples; however, concentration of all the metals were still below the current permitted (EU) limits. To study the adverse effect of heavy metals accumulation on various soil microbial activities, the sewage sludge samples (from wastewater treatment plant at Gurgaon) were artificially contaminated with heavy metal concentration above the EU limits. They were then applied to soil samples with different rates (0.5 to 4.0%) and incubated for 90 days under laboratory conditions. The samples were drawn at different intervals and analyzed for various parameters like pH, EC, total N, P, K, microbial biomass C, carbon mineralization, and diethylenetriaminepentaacetic acid (DTPA) exactable heavy metals. The results were compared to the uncontaminated sewage sludge. The increasing level of sewage sludge from 0.5 to 4% led to build of organic C and total N, P and K content at the early stages of incubation. But, organic C was decreased after 90 days because of decomposition of organic matter. Biomass production was significantly increased in both contaminated and uncontaminated sewage soil samples, but also led to slight increases in metal accumulation and their bioavailability in soil. The maximum metal concentrations were found in treatment with 4% of contaminated sewage sludge amendment.

Keywords : heavy metal, municipal sewage sludge, sustainable agriculture, soil fertility and quality
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