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Ways To Solve Soil And Water Pollutions By Chemical Laboratories

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Abstract
Dilution is not a way to prevent pollution. The industrial waste dumped and pumped in the nearby rivers and water bodies as well as landfills have been a serious concern of the environmentalists, scientists and the government authorities. But the regular practice of practical syllabi in the science laboratories of the educational institutions ignores the proper disposals of the waste produced.
Over the years, students regularly throw the test tube and other waste in the laboratory washbasins. In chemistry lab, these wastes always contain organic and inorganic substances which are harmful and hazardous to the environment as well as human health. Improper disposal of the hazardous chemicals and toxic materials in the drainage system contaminate the ecosystem and water bodies. Direct pouring of concentrated acids and bases corrode and damage the underground pipelines and their joints, thereby leaking the hazardous chemicals into the soil and ultimately leads to the underground water. Among these hazardous chemicals some of the organic molecules do not disintegrate with time and some heavy metals ions are very harmful.
Unfortunately, the pollution causing chemicals are not properly treated and to get rid of them, a major change in the syllabi is made so that these chemicals specially the heavy metals are now not used in the laboratories. These practicals are replaced by other safer and ecofriendly exercises. But to some courses these are essential and are still in use.
Through this article, we suggest that the laboratory waste should be disposed of properly. Acids and bases should be collected in a separate container and should not be poured in public sewage. The pH of the collected acids and bases can be tested and neutralized appropriately before discharging. The organic compounds can be treated according to their properties before dumping. The heavy metal ions can be collected in a separate container by the candidate in each practice. There are evidences of absorption of heavy metal ions like mercury and lead, by some plants like Tulsi and Water Hyacinth. A proper plan can be executed to plant these near laboratories in large containers to avoid the mixing of toxic metal ions in the ecosystem.
Keywords: *Tulsi, dilution, ecosystem.*

Introduction

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corrode and damage the underground pipelines and their joints, thereby leaking the hazardous chemicals into the soil and ultimately leads to the underground water. Among these hazardous chemicals some of the organic molecules do not disintegrate with time and some heavy metals ions are very harmful.

Heavy metals are natural constituents of the earth's crust, but human activities have drastically altered their geochemical cycles and biochemical balance. This results in accumulation of metals in plant parts having secondary metabolites, which is responsible for a particular pharmacological activity. Prolonged exposure to heavy metals such as cadmium, copper, lead, nickel, and zinc can cause deleterious health effects in humans. Thus some plants present in nature are effective against these metals that can reduce its effect whether present in soil and water.

Tulsi

The ability of tulsi to protect against the damaging effects of various toxicants has been documented in various experimental studies. Tulsi has been shown to protect against the toxic effects of industrial chemicals such as carbon tetrachloride,[1] copper sulfate[2] and ethanol,[3] In addition to protecting against toxic chemicals, tulsi has also been shown to protect against the toxic effects of heavy metals such as lead, arsenic, cadmium, chromium and mercury[4,5,6] and the toxic effects of radiation.[7,8,9,10] Thus resulting in reducing the effect of these heavy metals from the soil.

Aloe Vera

A study was conducted to determine the heavy metal accumulation in leaves of the Aloe vera plant. The results showed that the elements viz Na, K, Ca, Mg, P, Fe, Cu, Zn, Cd, and Pb were present in high concentrations in all the sites (Table 1). Comparative differences were found in the composition of all samples. The concentration of heavy metals is also depending on the physiographical conditions, developmental activity and type of waste generated from the area. In present study concentration of different heavy metals found high which may be due to absorption from soil. So, this study shows that aloe vera can easily absorb these elements from the soil which is very important.

Table 1: Concentration±S.E. of trace elements (µg) in leaves of *Aloe vera*

Element	Site I (Aligarh)	Site II (Mathura)	Site III (Agra)	Site IV (Bareilly)	Site V (Haldwani)	Site VI (Haridwar)
Na	309±11	300±10	338±14	273±10	190±8	215±7
K	362±10	310±8	271±10	301±18	180±10	282±11
Ca	289±6	280±7	326±11	356±16	297±11	315±9
Mg	125±8	120±6	198±9	155±12	210±9	138±6
P	120±10	98±6	101±6	153±13	82±7	127±9
Fe	19.23±1.8	18±2	13±2	16±1	9.2±1.3	11±2
Cu	2.34±0.6	1.23±0.3	2.14±0.2	1.81±0.8	1.14±0.3	1.32±0.3
Zn	198±6	200±8	180±11	236±11	92±8	219±10
Cd	1.2±0.1	1.3±0,1	1.36±0.2	1.93±0.4	1.41±0.2	1.67±0.6
Pb	12±2	8±1	16±2	24±3	8±1	10±1

Water Hyacinth

Water hyacinth could remove several heavy metals and other pollutants like Copper, Nickel and Zinc [13, 14, 15, 16, 17, 18]. Recorded achievements triggered efforts directed towards the utilization of water hyacinth in phytoremediation. On the removal of Cu2+ from aqueous solution by root of water hyacinth [19] showed that the biomass have a high affinity and large sorption capacity for the removal of the metal ion. Thus a study shows that the metals Cu, Ni and Zn in water samples were found to be less than the WHO's guideline value. However, the concentration of these metals in water hyacinth is much higher than it is in water. Resulting in giving conclusion that water hyacinth absorbs metals from the water as more traces of metals found in the plant than the water.

Conclusion

Plants can be used to remove the concentration of heavy metals and other chemicals from the laboratory effluents. This can be a cheap and sustainable method to resolve the problem of heavy metal deposition near chemical laboratories of educational institutions. Thus, these plants can be used to reduce soil pollution and water pollution done by the laboratory due to leakage of heavy metals.

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