IMPACT OF EDTA, FYM, VERMICOMPOST AND BIOINOCULANTS ON THE DISTRIBUTION OF MERCURY AMONG VARIOUS FRACTIONS IN CONTAMINATED SOIL AFTER HARVEST OF MUSTARD (BRASSICA JUNCEA) PLANTS

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Mercury (Hg) is recognized as a hazardous element globally and is not essential to plants. Over the past 150 years however anthropogenic Hg emissions have at least doubled global Hg input from natural Hg sources (Hylander and Meili, 2003). Mercury has a wide variety of uses in industry: medicine, dentistry, batteries, science and military applications. The burning of fossil fuels and medicinal waste incineration accounts for more than 80 % of all anthropogenic sources. Mercury levels in surface soils were reported to range from 0.003 – 4.6 μg g-1 on a global scale (Steinnes, 1997). However, the Hg levels may be rather high in contaminated

sites, e.g. up to 557 mg Hg kg-1 was found in the vicinity of a chlor-alkali plant at Ganjam, India (Lenka et al., 1992). The low solubility (0.025 mg/L) of Hg in water probably limits its uptake by plant roots (Bodek et al. 1988). The chemical state of Hg in soil is apparently related to soil properties, as well as the chemical character of the water phase, pH, the redox potential and the presence of organic matter and inorganic agents (Lifvergren, 2001). Hg has generally a high affinity for organic matter in soil matrix (Schuster, 1991). Hg is also adsorbed to minerogenic substances, e.g. clay minerals and hydrous oxides of Fe, Al, and Mn. Since Hg is strongly bound to soil constituents, normally, only trace content of Hg is found in the soil solution (Schuster, 1991). Dissolved forms of Hg in soil solution are free Hg ions and soluble Hg complex, which are easily utilized by living organisms. Some bacteria are capable of enzymatically reducing Hg2+ to Hg0 via mercuric reductase i.e. MerA (Schiering et al., 1991; Wagner- Dobler et al., 2000). Divalent Hg is a necessary precursor for the formation of compounds with increased solubility and mobility like HgCl2 and Hg(OH)2 or increased bioavailability such as methyl Hg or ethyl Hg. Therefore, as for other metals, Hg speciation is essential because it controls its solubility, volatility, reactivity, bioavailability, and finally, its toxicity (Stein et al., 1996).

The present investigation was undertaken to study the impact of EDTA, FYM, VC and bioinoculants on the distribution of Hg in different

chemical forms in contaminated soil with growing Indian Mustard (Brassica juncea) as test crop.

Materials and methods

A pot experiment using sandy loam soil was conducted in a screen house. Some selected characteristics of the soil are pH (1 : 2) 8.2; EC 0.48 dS m-1 in water; organic carbon 0.58 %; CEC 11.70 cmol(P+) kg-1 soil; total Hg 1.05 µg Hg g-1 soil. Five kg of air-dried soil (<2 mm) was filled in polyethylene- lined earthen pots to avoid contamination. Treatments consisted of Hg (40 µg Hg g-1 soil as mercury chloride), EDTA (2 mmol kg-1 soil as disodium salt), farm yard manure (FYM) and vermicompost (VC) 2 % by weight each, in all possible combinations. Bioinoculants (Azotobacter sp. and Pseudomonas sp.) were applied as seed treatment to selected treatment combinations.

The results indicated that among EDTA, FYM, VC and bioinoculants. Chelating agent (EDTA) was found to be most effective in enhancing water soluble and exchangeable fractions i.e. plant available fractions. FYM and vermicompost were effective in increasing organically bound fraction of Hg. The bioinoculants also solubilized or mobilized Hg into other fractions which may be available to plants but not significantly. So it may be concluded that for effective phytoextraction, chelating agent EDTA is a better option for mobilizing Hg to the plants.

ПСИХОЛОГО-ПЕДАГОГІЧНІ ОСОБЛИВОСТІ ВИКЛАДАННЯ ДИСЦИПЛИНИ «ОХОРОНА ПРАЦІ» В ЗАКЛАДАХ ФАХОВОЇ ПЕРЕДВИЩОЇ ОСВІТИ

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Головними характеристиками випускника будь-якого освітнього закладу є його компетентність і мобільність. У цьому зв'язку акценти при вивченні дисципліни переносяться на сам процес пізнання, ефективність якого повністю залежить від пізнавальної активності студента.

Педагогіка і психологія століттями розвивали теоретичні основи навчання, виховання і розвитку індивіда та залишаються найважливішим джерелом наукового обґрунтування освітнього процесу. Однак дійсне життя і соціально-історичні умови є визначальними у психолого-педагогічній закономірності розвитку особистості. Ці закономірності носять конкретний історичний характер і тому при зміні соціально-політичних умов змінюються і закономірності розвитку особистості.